

EAST AFRICA PROTECTORATE.

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ANNUAL MEDICAL REPORT

FOR THE

YEAR ENDING 31ST DECEMBER, 1912.

1382



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(No. 16/313/2.)

P.M.O.'S OFFICE,

NAIROBI,

31st October, 1913.

SIR,

I HAVE the honour to submit, for the information of His Excellency the Governor and for transmission to the Right Honourable the Secretary of State, the Medical Report on the health and sanitary condition of the East Africa Protectorate for the year 1912, together with the Returns, &c., appended thereto.

I have the honour to be,

SIR,

Your obedient servant,

A. D. MILNE,

Principal Medical Officer.

Hon. Chief Secretary,

Nairobi.

EAST AFRICA PROTECTORATE.

ANNUAL MEDICAL REPORT

FOR THE

YEAR ENDING 31ST DECEMBER, 1912.

PREFACE.

PLAN OF THE ANNUAL MEDICAL REPORT.

Last year, instead of considering the salubrity of the Protectorate as a whole, the report was presented in four portions—virtually four separate reports, dividing the country into areas described as (1) the Coast area, (2) the Mountainous area, (3) the Desert area, and (4) the Provinces of Kenia and Kavirondo. This was done partly for the sake of clearness in discussing a large number of names of places and diseases and keeping the immediate connection between them more apparent; and, partly in view of the infinite variety of the climatic conditions exhibited, it was felt that, perhaps, a more just estimation of the conditions of health might be arrived at. Though there is a certain obvious disconnectedness in this arrangement, the plan is adhered to in the present Report.

In adopting these more or less arbitrary divisions it must not be forgotten that the whole Protectorate is situated on the Equator, ranging in extent at its furthest limits from 4° lat. N. to 5° lat. S., and between the degrees of longitude 34° to 43° E. In three of these areas the physical features of the country differ from each other sufficiently markedly to warrant their being so differentiated.

In the Coast area the Province of Seyidie is contiguous with, and presents a marked similarity to the characteristics of the Tanaland Province. The altitude of these two Provinces varies from sea level to 5,393 feet, while the mean average rainfall for 1912 (calculated from the mean of all stations at which a record was kept) was 37·58 inches. So far as Europeans are concerned this area is generally regarded as a “Planters’ country,” with a small white population mostly connected with the trading interests of the town of Mombasa. The native population on this Coast belt is historically interesting, and consists of large numbers of Swahilis and Arabs, with, in the hinterland, several pagan tribes of whom but little is known.

The cocoa-nut palms of the Tanaland Province fade naturally into the arid hillocks and sandy desert of the Jubaland Province. But, as the outstanding feature of this portion of Africa and the adjoining Northern Frontier District is the immense sandy waterless wastes, both inhabited by nomadic Somalis and Gallas, it is easy to group them under the one heading, more especially as the link between them is the long line of the River Juba, as yet but little exploited by Europeans.

The Mountainous area takes in the two provinces of Ukamba and Naivasha with the Uasin Gishu Plateau—that portion of the country in which has settled the great bulk of the European immigrants. In this is situated Nairobi, the capital of the country, with its estimated population of 1,500 Europeans. The rainfall (for 1912—wetter than usual) was 55·85 inches, while the altitude from Ulu, mile 267 on the Railway 5,300 feet, runs up to nearly 9,000 feet at Molo.

The two provinces of Kenia and Kavirondo have been placed together, but it must be remembered that they are not contiguous. They have so much similarity as to justify their being included under one heading—each contains a mountain—the one, Kenia, 17,140 feet, the other, Elgon, 14,040 feet. Both support the largest number of native inhabitants; in fact the united number of the indigenous inhabitants probably amounts to more than half of the entire native population of the Protectorate. The elevation of Kavirondo varies from the level of the Victoria Nyanza, 3,700 feet, running up to the slopes of Elgon and the tableland of Trans Nzoia. Kenia is lower from something more than 1,500 feet in the Trans Tana (where the land slopes down towards the Indian Ocean and meets the boundaries of the Tanaland and Jubaland Provinces) up to the snow line on Mount Kenia.

Thus, in fixing these divisions it must not be forgotten that they are entirely for the sake of convenience in comparison.

The stimulating and exhilarating effect of the climate in the mountainous Zone, which has been chiefly responsible for giving the Protectorate its name amongst the colonies of the Empire, is equally felt in the upland regions of the Kenia and Kavirondo Provinces.

It is a curious fact, and worthy of note, that all these regions most sought after by the White and Boer immigrants were, with the exception of the fringe round Nairobi, the areas least inhabited by a permanent native population.

I.—ADMINISTRATIVE STAFF.

ADMINISTRATIVE STAFF OF THE PROTECTORATE.

The Medical Staff of the Protectorate as sanctioned is as follows :—

MEDICAL OFFICERS.

Principal Medical Officer	...	..	'	...	...	1
Senior Medical Officers	...	...	...	...	...	3
Medical Officers, permanent	...	...	...	...	...	12
Do. probationary	...	...	...	...	...	6

NURSING STAFF.

Matron, European Hospital, Nairobi	...	...	...	1
Nursing Sisters, Nairobi and Mombasa	...	...	...	6
Matron, Female Lunatic Asylum, Nairobi	...	...	...	1

OTHER OFFICERS.

Bacteriologist	...	...	...	...	...	1
Analyst	...	...	...	...	...	1

JUNIOR OFFICIAL STAFF.

Chief Clerk, P.M.O.'s Office	...	...	...	1
Assistant Clerk, do.	...	...	...	1
Medical Storekeeper	...	...	...	1
Superintendent, Lunatic Asylum	...	...	...	1
Dispensers	...	...	...	2

SUBORDINATE MEDICAL ESTABLISHMENT.

Assistant Surgeons	...	...	...	...	4
Sub-Assistant Surgeons	...	...	...	...	31
Hospital Compounders	...	...	...	...	21
Laboratory Assistants	...	...	...	...	2

SUBORDINATE CLERICAL ESTABLISHMENT.

3rd Grade Clerk, Medical Stores	...	...	...	1
4th do. P.M.O.'s Office	1
4th do. Health Office, Mombasa	1

MENIAL STAFF.

Asiatics and Africans	181
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TOTAL ... 280

APPOINTMENTS.

The establishment of Medical Officers was increased by two during the year, and the two temporary Medical Officers engaged in Sleeping Sickness investigations have been added to the permanent establishment.

The establishment of Nursing Sisters was increased by one, that of Sub-Assistant Surgeons by six, and a Laboratory Assistant was appointed to the Analytical Laboratory.

One Chief Clerk was appointed to the P.M.O.'s Office to fill a vacancy.

A Superintendent was appointed for the Lunatic Asylum to fill a vacancy. A temporary Matron for the female section Lunatic Asylum was appointed and will be confirmed as permanent from the 1st April, 1913.

Two Nursing Sisters were appointed to fill vacancies caused by resignations.

RESIGNATIONS.

- | | | |
|--------------------------------|-----|-----------------------------------|
| (1) During tour of service ... | ... | 2 Sub-Assistant Surgeons. |
| (2) On expiry of agreement ... | ... | 2 Nursing Sisters. |
| | | 1 Superintendent, Lunatic Asylum. |
| | | 1 Sub-Assistant Surgeon. |
| | | 2 Hospital Compounders. |

RECALLED TO THE INDIAN MEDICAL SERVICE.

One Sub-Assistant Surgeon.

DEATHS.

One Compounder died during the year from Beri-beri.

PROMOTIONS.

Dr. L. D. Lowsley promoted Senior Medical Officer 12th December, 1912, vice Dr. J. T. C. Johnson, transferred to Hong Kong as Principal Civil Medical Officer.

Three probationary Medical Officers on completion of probationary period were promoted to the permanent staff.

CHANGES.

Dr. J. T. C. Johnson was promoted and transferred to Hong Kong as Principal Civil Medical Officer in December.

Dr. R. Small was appointed Acting Bacteriologist—January to July, and Acting Medical Officer of Health, Mombasa, November–December.

Dr. W. Owen-Prichard was in medical charge of Kenia Province from January to May, and on his return from six months' leave in December was appointed Medical Officer in charge of the European Hospital, Mombasa, vice Dr. A. Robertson, who was shortly due to proceed on leave.

Dr. H. A. Bödeker was on medical charge of Naivasha Province from January to May, and acted as Medical Officer of Health, Nairobi, from June to December.

Dr. C. L. Chevallier proceeded from Kismayu to Serenli in January to investigate and report on an outbreak of Beri-beri amongst the troops quartered there. He returned at the end of June and proceeded on seven months' leave in July. He was relieved at Kismayu by Dr. C. J. Wilson, who continued in medical charge to the end of the year.

Dr. A. Robertson relieved Dr. W. J. Radford as Medical Officer in charge European Hospital, Mombasa, in July, when the latter proceeded on six months' leave of absence.

Dr. T. F. Lumb took over medical charge of the Native Civil Hospital, Nairobi, in March from Dr. L. D. Lowsley, who proceeded on six months' leave (April–November).

Dr. L. D. Lowsley was appointed Medical Officer in charge Kenia Province in December vice Dr. N. M. Leys, who proceeded on four months' leave at the end of the year.

Dr. A. Mouat relieved Dr. J. T. C. Johnson as Medical Officer in charge European Hospital, Nairobi, in May and remained in charge of that institution till the end of the year.

Dr. J. Pugh relieved Dr. H. A. Bödeker as Medical Officer in charge Naivasha Province in June. He afterwards proceeded on six months' leave in August and was relieved by Dr. V. G. L. Van Someren.

Dr. R. Hamilton proceeded from Kisumu to Lamu in April and assumed medical charge of Tanaland Province from Dr. J. L. Gilks, who proceeded on six months' leave.

Dr. J. L. Gilks on return from leave in November took over medical charge of the Native Hospital, Kisumu, from Dr. A. D. J. B. Williams, who had been in temporary charge from September.

Dr. V. G. L. Van Someren was on arrival in this Protectorate temporarily posted to the Native Hospital, Kisumu, for duty from June to August, when he proceeded to Nakuru to relieve Dr. J. Pugh who was due to proceed on leave.

THE COAST ZONE.

The Medical Staff in these two provinces consisted of Dr. W. J. Radford, M.R.C.S., L.R.C.P., Senior Medical Officer in charge of the European hospital, Mombasa, and the Seyidie Province from January to July; Dr. A. Robertson, M.B., B.Ch., from July to December (during absence on leave of Dr. Radford); Dr. F. L. Henderson, M.R.C.S., L.R.C.P., in medical charge of the Native Civil Hospital, Mombasa, and Section of railway line in Seyidie Province; Dr. R. Small, M.R.C.S., L.R.C.P., D.P.H., Medical Officer of Health, Mombasa, from October to December, Dr. J. A. Haran M.D., C.M.G., from April to October; and Dr. N. M. Leys, M.B., B.Ch., from January to April.

Lamu and the Province of Tanaland were in medical charge of Dr. G. L. Gilks, M.R.C.S., L.R.C.P., F.R.C.S. (Edin), from January to April; and Dr. R. Hamilton, B.Ch., M.D., from April to December.

THE MOUNTAINOUS ZONE.

This comprises the two Provinces of Ukamba and Naivasha, including the Uasin Gishu Plateau with an altitude varying up to 9,000 feet. The greater part of these areas is generally regarded as being specially adapted for settlement by Europeans. The capital of the Protectorate and the township of Nakuru, changing centres of the Uganda Railway, are respectively situated in them.

Nairobi:—European Hospital:—Dr. J. T. C. Johnson, M.B., C.M., F.R.C.S., from January to June; Dr. A. Mouat, M.B., B.Ch., from June to December. Native Civil Hospital:—Dr. T. F. Lumb, M.R.C.S., L.R.C.P., from April to December; Dr. L. D. Lowsley, M.R.C.S., L.R.C.P., from January to April. Health Officer:—Dr. A. Robertson, M.B., B.Ch., from January to June; and Dr. H. A. Bodeker, M.B., C.M., from July to December. The Medical Officer in charge of the Native Civil Hospital was also in charge of the Gaol, Military Lines and Police and the Health Officers in charge of the Lunatic Asylum.

Naivasha Province:—Dr. H. A. Bodeker, M.B., C.M., from January to June; Dr. J. Pugh, M.R.C.S., L.R.C.P., July to August; Dr. V. G. L. van Someren from August to December; and Dr. W. H. Heard, M.B., B.Ch., as District Surgeon, Uasin Gishu from November.

THE KENIA AND NYANZA PROVINCES.

Kenia Province:—Dr. W. Owen, M.R.C.S., L.R.C.P., in charge from January to May. Dr. N. M. Leys, M.B., B.Ch., from May to December.

Nyanza Province:—Dr. Cherrett, M.R.C.S., L.R.C.P., D.P.H., January to September; Dr. J. Pugh, M.R.C.S., L.R.C.P., January to June; Dr. A. D. J. B. Williams, M.R.C.S., L.R.C.P., B.A., from September to December.

THE DESERT ZONE.

The headquarters of the Northern Frontier District is Marsabit, and has been under the charge of Dr. G. R. H. Chell, M.R.C.S., L.R.C.P.

Kismayu is the centre of the Jubaland Administration at the mouth of the River Juba. Dr. C. L. Chevallier, M.R.C.S., L.R.C.P., was in charge from January to June; Dr. C. J. Wilson, M.B., B.Ch., from June to December.

II.—PUBLIC HEALTH.

(a.) GENERAL REMARKS.

(i.) GENERAL DISEASES.

THE COAST ZONE.

The general effect of this year has been to show an improvement over the conditions of the previous year, in some measure attributable to the partial failure of the heavy rains in the greater portion of the year, followed by a diminution of such diseases as bronchitis, malaria and diarrhœa. As usual, diseases of the digestive system and local injuries rank high as causes for appearing on the sick list. Eye affections also predominate, more especially in the more sandy and less humid regions of Tanaland and Jubaland. In the town of Lamu, an interesting condition of retinitis has been observed due to the effects of sun glare; shading the eyes for a few days effects a cure. Here also the undue amount of insanitary conditions noted in last year's report is still recorded, and the fact that many Asiatics and Swahilis are addicted to the opium habit.

THE MOUNTAINOUS ZONE.

The effect of an increased rainfall is always reflected in an increase in the number of cases of sickness, and 1912 was no exception to this axiom. There was an increase in the number of serious cases amongst the white population, due, in some measure, to the greater influx of people.

Digestive and respiratory troubles, particularly pneumonia, and local injuries were as prominent as in other parts of the Protectorate.

Of minor ailments, influenza at Nakuru, and tonsillitis, generally ascribed to dust infections during the dry seasons of the year and known locally as "Kisumu," "Mombasa" or "Nairobi" throat were common, particularly in the last mentioned town, as well as veldt sores and jiggers.

THE KENIA AND NYANZA PROVINCES.

On the whole a better standard of health was maintained during the year, and beyond the usual amount of respiratory and digestive diseases and local injuries, there is no particular incidence of disease to record.

THE DESERT ZONE.

Pneumonia is surprisingly common in the hot arid wastes of Jubaland; eye affections and local injuries are not infrequent.

(ii.) COMMUNICABLE DISEASES.

MOSQUITO OR INSECT-BORNE.

THE COAST ZONE.

The number of cases of malaria treated during the year was less than in 1911, the greater number of the cases being of a mild type. The lesser rainfall would account for this. Special mosquito rules under the Township Ordinance (which are in force at Nairobi) were made applicable to Mombasa in July. But the dependency of the inhabitants on a supply from wells, which in time of scarcity many have to purchase by the kerosine tinfull, and the peculiar

condition of the town, rendered any application of them a matter of extreme caution. The greatest prevalence commences just after the onset of the rains and continues for some time after their cessation. The months chiefly responsible in this respect are November and December and March to June inclusive. Lamu and Kismayu are the towns with the least incidence of malaria; at the former the anopheles is not very much in evidence, while in the latter its presence has, so far, not yet been recorded. Manifestations of malaria in the latter town are due to exposure on the banks of the Juba.

THE MOUNTAINOUS ZONE.

Malaria.—This prevailed to a greater degree than last year throughout the Provinces, Nakuru showing the least incidence, anopheles being rarely found there. The bulk of the cases appeared during the 2nd and 3rd quarters of the year.

THE KENIA AND NYANZA PROVINCES.

Malaria.—3,134 cases came under treatment as indoor and outdoor cases. Malaria showed a notable increase during the rainy months, though the incidence varied slightly at the different stations—at Kisumu the first six months; Mumias the middle six months; the Nandi plateau the third quarter; Fort Hall and Meru the second quarter of the year. At Kitui, from May to October, a total of 1·22 inches of rain fell out of a total of 62·77 inches recorded for the 12 months.

The increase of malaria in the Kenia Province is in part due to the return of large numbers of labourers from infected coast districts, and the mosquito-breeding possibilities of their native water supplies, and the increased returns from the fact that the unthinking savage is beginning to realize that in quinine the white man possesses a valuable cure.

Tick Fever.—Further cases of illness caused by the *Spirochoeta Duttoni* were observed in the Fort Hall district, though, so far, none have been recorded amongst the Kairronds.

Filariasis and Leprosy.—Both these diseases are recorded as fairly common. Cases of elephantiasis abound, more particularly on the Yala River in the northern portion of the Kavirondo Province, affecting a certain section of the Nandi.

THE DESERT ZONE.

Malaria.—The Gosha district (on the banks of the River Juba) is heavily affected. Observations would show that such cases as occur in Kismayu are imported ones.

INFECTIOUS OR EPIDEMIC.

THE COAST ZONE.

It is gratifying to record a very great diminution for the last half of the year in the number of admissions for dysentery, and that the action towards controlling it has borne fruit.

Only three cases of enteric fever amongst Europeans were reported, all of which proved fatal. Two were landed from north bound ships in harbour, and there is a strong suspicion that uncooked vegetables from Nairobi were the cause of the third.

During the year the town of Mombasa was visited by a severe epidemic of small-pox, which came to light in the month of July. The island was declared infected, and the new Compulsory Vaccination Ordinance applied. In all, 295

cases were reported with 63 deaths. It seems likely that the infection was imported from Arabia. In any case the Mombasa focus was the cause of isolated cases being detected at Malindi and Kisumu, and, without doubt, spread the infection throughout the little known districts in the hinterland. Nearly 34,000 vaccinations were performed by the Health Office staff exclusive of those done by private practitioners, individuals and missionaries, with a free issue of lymph from the Government Laboratory. Only one case occurred amongst Europeans, a child, probably infected by the native ayah.

This was not the only visitation experienced by Mombasa, for its "singular immunity" to plague, so often commented upon in previous annual reports, disappeared on the 28th August, when a case of pneumonic plague was detected in the Native Hospital followed by a second case. The first was a Kikuyu labourer who had been living in the Public Works Department Indian landies close to Mombasa Railway Station. It was subsequently discovered that, in all, four persons had succumbed to the disease, and knowledge of their condition and of a mortality amongst the rats in the house had been successfully concealed from the medical authorities. Though a close outlook was kept for the occurrence of further cases it was not till the 4th October that it was discovered that three more deaths had occurred in another house between the 18th of September and 4th October. An effort to confirm the diagnosis in this last case, by taking spleen smears, was met by a strenuous opposition on the part of a large section of the Indian community, who practically banded themselves to frustrate all efforts of the health and administrative authorities to deal with the spread of the disease. Out of it came the fact that no less than 13 members of one household who had either lived in the infected house, tended the sick, or visited them, had succumbed to plague. Up to the end of the year 27 cases only had come to the knowledge of the Health Office. There was no doubt that practically the whole coloured population of the varied sections of the Island, made a most determined—and, it is to be feared, successful—effort to conceal the cases, and to thwart preventive measures on the part of the Medical Department and local Administration. With a very insufficient staff, and more or less single-handed, it was beyond the powers of the Medical Officer of Health to take radical measures in the face of the chaotic state of legislation in this treaty town—a condition which has been commented upon in previous reports. It is, however, satisfactory to record, writing at this juncture, that a very much improved tone prevails in the island with respect to the resistance of the Islanders.

But few cases of venereal diseases were recorded—27. Though this number affords no criterion of the extent to which it prevails, it is certain that gonorrhœa and syphilis do not play a prominent part in the sick admission rate at the coast; in fact at Lamu syphilis is noted as being rare.

Such cases of tuberculosis as occurred were chiefly confined to Asiatics.

THE MOUNTAINOUS ZONE.

Plague.—After the lapse of a year plague again made its appearance in the Indian Bazaar, Nairobi, on the 5th of September. There were 9 cases in all. In October a fatal case occurred at Kyambu, and seven cases at Machakos with six deaths. In 1911 there were a total of 39 cases, 22 of which were fatal, giving a death ratio of 56·41 per cent. of the cases admitted. In 1912 there was a total of 17 admissions and 11 deaths—a mortality rate of 64·71 per cent. of admissions.

Dysentery accounted for 612 cases coming under treatment as indoor and outdoor patients; of these 52 died. Fifteen Europeans are included in the total number of cases treated, with no deaths. Taking into consideration the ever-increasing migratory habits of the natives, and the thereby ever increasing pollution of the roadside water, holes and rivers, the cause of its spread is not to be wondered at.

Enteric.—The total number of admissions was 23, with two fatalities, giving a death rate of 8·69 per cent. of admissions. This subject is discussed under the section devoted to European Hospitals, and in more detail in the Report submitted as an appendix.

THE KENIA AND NYANZA PROVINCES.

Plague.—Kisumu, as usual, responded with its annual visitation, 79 cases occurred between March and the end of the year, as contrasted with 64 in 1911. The death rate was 89·87 per cent. in 1912 and 76·87 per cent. in 1911.

Venereal diseases.—I think that there is little doubt that syphilis is on the increase in these two Provinces—to what extent in the Kenia Province I am unable to say—but certainly in the Lumbwa and Nandi districts where prostitution is ingrained.

THE DESERT ZONE.

Small Pox.—This was imported from Mombasa into Jubaland by sea, on three occasions; only one contact case resulted, though it was reported to have also appeared around Deshek Wama. Two of the four cases were fatal.

Dysentery.—Like malaria is prevalent on the banks of the river.

Beri-beri.—Early in the year a disastrous outbreak occurred amongst the troops stationed at the military outpost, Serenli, some 400 miles up the river. This outbreak served to accentuate the extreme isolation of such parts as Serenli, Moyale, Marsabit, Liongoleni on Lake Rudolph, and Ngabotok near by Mount Elgon, and the absence of transport commented upon in last year's report. Out of a total number of 289 troops, women and followers, stationed at Serenli 112 were attacked and 44 died, an admission rate of 38·75 per cent. of strength and a death rate of 39·28 per cent. of admissions. Dr. Chevallier, who investigated the outbreak, and whose report is submitted as Appendix No. 3, hesitates to attribute the cause to faulty rice rations.

HELMINTHIC.

THE COAST ZONE.

Helminthic diseases are more common at the coast than elsewhere. Mombasa affords a grand field for the study of ankylostomiasis in spite of the fact that only 11 cases were recorded during the year. Many of the cattle in the Lamu district are infected with *tænia*, and the parasite is fairly common amongst the natives. *Ascarides* and *Bilharzia* are met with from time to time.

Beri-beri.—One case appeared in the prison at Mombasa. Its origin was not traced, but the dietary in force is sufficiently ample and varied to lead one to suppose that its occurrence was accidental.

Early in the month of February news of a very serious mortality from this cause amongst the Nubian troops stationed at the military outpost at Serenli on the River Juba was brought down the river. Dr. Chevallier's report on this outbreak accompanies this report as an appendix.

Bilharzia is confined to certain districts on the coast. *Dracontiasis* is unknown so far.

(b) **EUROPEAN OFFICIALS.****GENERAL REMARKS.****THE COAST ZONE.**

The table below gives the comparative statistics of the sickness, mortality, and invaliding rates amongst European officials for the past two years.

The general health of the officials at the coast was an improvement on previous years. There is no doubt that those who are in occupation of the better class of houses exposed to the sea breezes enjoy a more measurable amount of protection than those who are not so favourably situated; having regard to the insanitary conditions which prevail at Mombasa, and to which attention has been so often directed, it could hardly be otherwise. It is worthy of note that with the prevalence of small-pox and plague during the year no official nor member of his family were attacked by either disease.

THE MOUNTAINOUS ZONE.

Malaria, as usual, is responsible for the largest number of admissions, enteric and tonsillitis being fairly frequent. There was an increase in the number of admissions compared with last year.

THE KENIA AND NYANZA PROVINCES.

Officers in outstations probably enjoy a better standard of health than those whose duties keep them immured at headquarters. On the whole there has been an improvement on previous years.

THE DESERT ZONE.

The health of officials in these desert zones was on the whole remarkably good, even though in the very hot and dry air, most of them have an inconceivable amount of hard trekking and exposure to undergo and exhibit much endurance. No accurate statistics are as yet available of the odd 50 or so European officials and others, in the Province.

**TABLE SHOWING THE SICK, INVALIDING AND DEATH RATES
AMONGST EUROPEAN OFFICIALS AT THE COAST ZONE.**

	1911.	1912.
Total number of officials resident during the year ...	82	108
Average number resident	56	91
Total number on sick list	56	123
Total number of days on sick list	701	766
Average daily number on sick list	1.9	2.09
Percentage of sick to average number resident	3.4	2.30
Average number of days on sick list for each patient	12.5	6.20
Average sick time to each resident	12.5	7.09
Total number invalided	1	2
Percentage of invaliding to total residents	2.4	1.85
Total deaths	3	<i>Nil</i>
Percentage of deaths to total residents	3.6	<i>Nil</i>
Percentage of deaths to average number resident	5.2	<i>Nil</i>

TABLE SHOWING THE SICK, INVALIDING AND DEATH RATES
AMONGST EUROPEAN OFFICIALS IN THE MOUNTAINOUS
ZONE.

	1911.	1912.
Total number of Officers resident during the year ...	286	336
Average number resident	260	272
Total number on sick list	217	239
Total number of days on sick list	1,140	2,052
Average daily number on sick list	3.12	5.61
Percentage of sick to average number resident ...	1.2	2.06
Average number of days on sick list for each patient ...	5.25	8.58
Average sick time to each resident	4.38	6.11
Total number invalided	Nil	5
Percentage of invaliding to total residents	Nil	1.49
Total deaths	1	2
Percentage of deaths to total residents ... ..	.35	.59
Percentage of deaths to average number resident ...	.38	.73

TABLE SHOWING THE SICK, INVALIDING, AND DEATH RATES
AMONGST EUROPEAN OFFICIALS IN THE KENIA AND
NYANZA PROVINCES.

	1911.	1912.
Total number resident	93	123
Average number resident	68	60
Total number on sick list	93	87
Total number of days on sick list... ..	859	587
Average daily number on sick list	2.35	1.60
Percentage of sick to average number resident ...	3.47	2.66
Average number of days on sick list to each patient ...	9.23	6.75
Average sick time to each resident	12.63	4.77
Total number invalided	3	1
Percentage of invalidings to total residents	3.22	.81
Total deaths	1	2
Percentage of deaths to total residents	1.07	1.62
Percentage of deaths to average number resident ...	1.47	3.33

TABLE SHOWING THE SICK, INVALIDING AND DEATH
RATES AMONGST EUROPEAN OFFICIALS IN THE EAST
AFRICA PROTECTORATE.

	1910.	1911.	1912.
Total number of Officials resident	424	470	567
Average number resident	365	383	423
Total number on sick list	307	413	449
Total number of days on sick list	3,034	3,410	3,405
Average daily number on sick list	8	9	9.30
Percentage of sick to average number resident ...	2.19	2.32	2.19
Average number of days on sick list for each patient	10	8	7.58
Average sick time to each resident	8	7	6.01
Total number invalided	2	4	8
Percentage of invaliding to total residents ... ..	.47	.85	1.41
Total deaths	3	4	4
Percentage of deaths to total residents ... ..	.71	.85	.71
Percentage of deaths to average number resident ...	.82	1.03	.95
Number of cases of sickness contracted away from residence	—	—	—

(c.) NATIVE OFFICIALS.**THE COAST ZONE.**

The statistical tables under this head which have been collected are still so incomplete that it has been deemed advisable to incorporate the returns in the table for the whole of the Protectorate. Next year it is hoped, now that proper registers have been issued, to make a commencement with more definite information and statistical tables.

THE MOUNTAINOUS ZONE.

Accurate separate statistics are not available and these are included under General Native Population.

THE KENIA AND NYANZA PROVINCES.

As the returns are not sufficiently complete they are incorporated under sub-heading (e).

**TABLE SHOWING THE SICK, INVALIDING AND DEATH RATES
AMONGST NATIVE OFFICIALS IN THE EAST AFRICA
PROTECTORATE.**

1. Total number resident during year...	...	...	...	1,283
2. Average number resident ...	...	...	...	1,202
3. Total number on sick list ...	...	...	...	1,266
4. Total number of days on sick list ...	...	...	...	7,809
5. Average daily number on sick list ...	...	...	...	21·34
6. Percentage of sick to average number resident ...	...	...	...	1·77
7. Average number of days on sick list to each patient ...	...	...	...	6·18
8. Average sick time to each resident ...	...	...	...	6·09
9. Total number invalided ...	...	...	...	18
10. Percentage of invalidings to total resident ...	...	...	...	1·40
11. Total deaths ...	...	...	...	1
12. Percentage of deaths to total residents ...	...	...	...	·08
13. Percentage of deaths to average number resident ...	...	...	...	·08

(d) GENERAL EUROPEAN POPULATION.**THE COAST ZONE.**

Very little accurate information can be given under this head, as (with the exception of those residing in the island of Mombasa) the planters are scattered and mostly not in touch with any medical practitioner. Still, it may be said that, on the whole, their general health has been good. Malaria, as might be supposed, is accountable for a large amount of sickness. From the approximate figures supplied by Dr. Robertson, Medical Officer in charge of the European Hospital, Mombasa, it would appear that they are more exposed to infection than the official class; he notes that out of an average of 52 officials resident in Mombasa there were 37 cases of malaria or 71·15 per cent.; approximately there were an average number of 120 resident of the general population, and of these 106 contracted malaria or 88·33 per cent. He attributes this state of matters largely to the congested state of the town and the consequent necessity of finding lodgings in unsuitable houses in, or in close proximity to, the native town. The seasonal incidence of malaria was on a par with previous years, being heaviest in the first and second quarters of the year. The type was principally benign tertian but there were three cases of malignant malaria, two of which terminated fatally.

THE MOUNTAINOUS ZONE.

The estimated native population of the two provinces is 240,000 as calculated on the hut tax returns.

BIRTHS AND DEATHS.

THE COAST ZONE.

The system of Registration of Births and Deaths is still incomplete, except with reference to Europeans. Births are not recorded, and deaths only in townships.

There were 755 deaths in Mombasa (316 reported due to "natural causes") out of an estimated population of 26,786. In 409 cases the cause of death is given as "unknown," 63 were due to small-pox, 51 to dysentery, and 25 to plague. The death rate for Mombasa for the past three years is as follows :—

1910	...	...	...	...	...	...	...	25·7
1911	...	...	...	...	...	...	...	24·3
1912	...	...	...	...	...	...	...	28·4

The epidemics would account for the increase.

THE MOUNTAINOUS ZONE.

Births are not registered, and only those deaths which occur in townships. The death-rate in Nairobi for Asiatics and Africans was :—1911, 19·9 per 1,000 ; 1912, 22·9 per 1,000. Tables showing numbers treated as indoor and outdoor patients in the various hospitals and dispensaries are appended.

INFANTILE MORTALITY.

No data are available to give any information under this head.

III.—SANITATION.

(a) **GENERAL REVIEW, &c.**

NOTE.—As no particular object is to be gained by contrasting the progress made in sanitation work in the four zones, this and the following sections of the report refer to the Protectorate as a whole.

(i.) **ADMINISTRATION.**

There are only three Medical Officers who are entirely occupied with the care of Public Health—the Medical Officers of Health in Mombasa, Nairobi and Kisumu. These officers have no executive functions; only at one town—Mombasa—has there been any attempt to provide a small clerical and office staff and a mosquito gang. All the other duties usually associated with a Health Office are under the control of other departments. Thus the progress made in sanitary reform has been but little, is merely a continuation of the old system, and has depended largely on individual efforts, the results of which are all too quickly lost sight of.

LAWS PASSED.

The legislation governing all sanitary action in the Protectorate consists of the following :—

(1) “The Infectious Diseases Ordinance of 1903,” an Ordinance to prevent the introduction of Infectious or Epidemic Disease.

(2) “Plague and Cholera Ordinance of 1907,” governing overseas introduction of these diseases.

(3) Rules to prevent Sleeping Sickness, under the Infectious Diseases Ordinance.

In addition to these there are the various rules published under these Ordinances, and those under the Township Ordinance containing the various health provisions relating to townships. All these rules are scattered through the successive years of the *Official Gazette*.

During the year the following were added to the Statute List :—

(4) The Vaccination Ordinance, 1912.

(5) Additional (Mosquito) Rules under the Township and Infectious Diseases Ordinances made applicable to Mombasa as well as Nairobi.

(6) The Quarantine Ordinance, 1912. An Ordinance to prevent the introduction of diseases into the East Africa Protectorate.

The urgency of combining all these regulations in one comprehensive Public Health Ordinance yearly becomes more apparent, and in it incorporating such other necessary laws as Notification of Infectious Diseases and Port Quarantine Act. More effective legislation is required also, to name but one, for the registration of all births and deaths.

(ii) **PREVENTIVE MEASURES.**

MOSQUITO AND INSECT-BORNE DISEASE.

MALARIA.

The collection of bottle refuse, oiling of pools and marshes too large for drainage, and the cutting of channels to remove stagnant water was carried out in all three towns. In Nairobi 165 notices were served on householders

for the existence of nuisances, with special reference to the breeding of mosquitoes. It is significant that 130 of these were served in the first two quarters of the year during the rains. In this town the filling in of large excavations and borrow-pits was done by the Railway and Public Works Departments.

Free distribution of quinine was instituted at Mombasa and, in continuation of last year's system, at Kisumu and Fort Hall, but not many took advantage of it.

TRYPANOSOMIASIS.

Sleeping sickness is entirely confined to the shores of and islands in the Victoria Nyanza. There has been no medical survey of the infected areas since Dr. Cherrett's and Dr. Pugh's Report in 1910, but it is fairly evident that the danger of sleeping sickness yearly diminishes in importance. It is rare for cases to be discovered in the out-patients of the Native Hospital at Kisumu, and with the annual emigration of some 30,000 Kavirondo labourers from the Province, rarer still for an odd case to be picked out from the line. Each year shows an increase in the hut tax returns from the infected districts, showing that the repopulation of the decimated districts is proceeding slowly but surely. East Africa has been more fortunate than her neighbours, for the expansion of European activities has, so far, impinged but little into the infected zone. Propositions for a sisal concession, the establishment of a boat building yard in a badly infected and uninhabited island, concessions for the reaping of papyrus for the manufacture of paper or of "Suddite," have all been refused in this native reserve. With the extinction of the sleeping sickness camp the main control has been the inspection of the labour passing through Kisumu.

FILARIASIS.

Elephantiasis Arabum is found in the Nyanza Province, amongst both the Kavirondo and, more particularly, that section of the Nandi dwelling on the banks of the Yala River. It is fairly common also in the Coast regions in the Kenia Province.

EPIDEMIC DISEASES.

GENERAL.

The Protectorate suffered from two visitations during the year, small-pox and plague. The former occasioned a serious outbreak in Mombasa, two small epidemics in the Fort Hall district, and various isolated cases in other parts of the country. The immunity of Mombasa to plague, for so many years a cause for blind congratulation, was broken into with the appearance of the pneumonic form in the latter part of the year. Nairobi and Kisumu also furnished their annual quota of cases. The grave thing about these two centres is the way the disease is yearly radiating out to attack fresh centres and form new *foci* for its spread.

The insufficiency of staff, isolation hospitals, contact camps, disinfecting apparatus, and all the necessary appurtenances for dealing with infectious and epidemic diseases renders it well-nigh impossible to exercise more than a superficial control over the course of epidemics.

PLAGUE.

As plague has been present in Nairobi since 1902 and in Kisumu since at least 1905, they may be regarded as endemic centres. There is, I think, little doubt that its appearance in Mombasa was due to importation from one or other of these places. And with the existing sanitary condition of Mombasa

it is likely that it has come to stay. That Nairobi may now be regarded as a focus for the spread of plague the following may be quoted:—"During the month of October a fatal case of plague occurred on a European farm in the district of Kyambu (situated some 10 miles from Nairobi on the main road into the Kenia and Fort Hall districts). He was an Indian who kept a shop with attached grain store on the farm. Another Indian who lived with deceased also became affected and died in the quarantine camp; plague infected rats were found on the premises. It was also stated that a rat mortality had been noticed in several farms in the neighbourhood, and in one farm three native children died under suspicion of plague, as dead rats had been seen in their huts. It was found that all the rat infected huts possessed grain stores in the hands of Indian traders, and in all probability the infection was conveyed in empty gunny bags (used for the carrying of grain) from the Indian Nairobi bazaar. It is sufficiently clear that the main means of the spread of plague is the petty Indian trader with his 'duka' and grain bags."

The preventive measures adopted were:—isolation of sick and as many contacts as could be seized; the disinfection of the houses and effects in Kisumu and Mombasa, by the closing of the house and the burning of sulphur and spraying of floors and wells with a disinfecting fluid; in Nairobi, by means of a portable Clayton. In addition, at Nairobi, a portion of the goods shed was converted into a disinfecting chamber and infected grain bags and goods "Claytonized" by means of the largest size Clayton fitted on two trucks. At Kisumu these goods and all native passengers' effects were disinfected by a smaller sized Clayton fitted on a truck in the railway yard. Passengers leaving Kilindini and Kisumu by the railway or steamers were inspected; at the latter place over 10,000 were so dealt with.

The trapping of rats was persisted in and the following table records the number of rats caught:—

Mombasa	...	...	...	...	...	...	1,724
Nairobi	...	...	...	...	...	...	870
Kisumu	...	...	...	...	...	...	9,636
							<hr/>
							12,230
							<hr/>

In Mombasa no infected rats were found, even though it was discovered that there had been a rat mortality in certain quarters. In Nairobi 97 rats showed infection. It is significant in Kisumu that 45 per cent. of the female rats caught were pregnant. Infected rats were found there on eleven occasions.

Haffkine's prophylactic was undoubtedly the most valuable means at our disposal for preventing plague. The numbers inoculated were:—

Mombasa	...	...	...	..	...	...	89
Nairobi	...	...	...	...	...	...	1,400
Kisumu	...	...	...	...	...	...	6,770

No case of plague occurred in those inoculated with Haffkine's prophylactic; it was put to a severe test in Kisumu. Though rats were known to be dying in the bazaar there was no evacuation of quarters, and *b. pestis* showed a very decided selective preference for the uninoculated Indian, leaving in a household all the members of which had been protected. A trial was made with the Pasteur's Institute vaccine, a preparation which is stated to be valid for only three months. Eight of those so treated contracted plague, one within seven days, and the other seven more than three months afterwards.

There being no infectious diseases hospital at Mombasa, one was hastily improvised by utilising the, as yet, unused new model dairy sheds; Nairobi possessed a Quarantine Camp with galvanized iron landies; Kisumu occupied the tumbledown old Native Hospital.

SMALL-POX.

This broke out in Mombasa in March. It was not controlled until some 34,000 people had been vaccinated. Its long duration was entirely due to there being no means of segregating the sick and contacts. With this disease, as in plague, there was a too successful concealment of cases, and a more than passive resistance by the town inhabitants to the action of the authorities.

Table showing number of cases of small-pox for the last three years, and the number of vaccinations performed :—

		1912.	1911.	1910.	
	Cases of small-pox ...	323	159	21	
	Vaccinations	79,252	15,167	14,353	

The total quantities of lymph issued during 1912 was sufficient for 140,000 persons, but returns from missionaries and other private persons to whom lymph was issued are not to hand.

The lymph used was entirely manufactured at the Bacteriological Laboratory, where results could be inspected. It is estimated that from 80 per cent. to 90 per cent. were successful.

CHOLERA.

Though the island of Zanzibar was visited by a severe outbreak of cholera which commenced in July, it is satisfactory to record that there was no suspicion of a case having reached the mainland or island of Mombasa.

DYSENTERY.

It was not till the middle of the year that there was any amelioration of the unhygienic conditions noted in last year's report as prevailing amongst the up country labourers in the coast belt. Not till the Sanitation Department is in working order with inspecting officers continually visiting the working centres where labour is distributed will there be any improvement under this head.

ENTERIC.

The most important point brought out by the experience of the year's work in typhoid has been to prove—what for long has been surmised—the rôle played by the native as a typhoid “carrier.” Enteric, especially the ambulant form, is only too easily overlooked in the black man, and this point is brought out by the report (submitted as an Appendix) drawn up by Dr. Haran, C.M.G., and Dr. Robertson, on the cases which occurred in Nairobi. A leaflet drawing attention to the causes and prevention of typhoid was circulated during the year.

HELMINTHIC DISEASES.

Beyond individual efforts in out-patient cases no general measures were promulgated.

(iii.) **GENERAL MEASURES.****SEWAGE DISPOSAL.**

The single bucket system is in vogue in the three towns, chiefly applicable to Europeans, Goanese, Asiatics, and in the public latrines. Natives either use the bush or cesspits in their own houses or compounds. In Mombasa the bucket contents are collected in night soil trollies and are tipped into the sea.

In Nairobi they are buried in shallow trenches, which, so far, have given rise to no nuisance; in Kisumu, in pits which are foul in the extreme. The conservancy control is not vested in the hands of the Medical Officer of Health.

DISPOSAL OF REFUSE.

The scavenging of the streets is generally performed in a perfunctory manner owing to insufficient staff and lack of proper supervision. In the main streets the droppings are collected, in the side streets mostly brushed to the sides. Municipal dustbins are provided free at certain street corners and localities, and are obligatory in compounds. Their contents are removed by carts. Otherwise the refuse is burnt in pits set aside for the purpose. Only at Mombasa is a two-celled destructor used, and the additional two new cells constructed were not put into action.

WATER SUPPLY.

Mombasa's new water service not yet being within range of completion, the town is still dependent on tanks and polluted wells. It would appear that considerable delay in the construction of the pipe line from the Shimba Hills has been occasioned by difficulty of labour supply, though a large portion of the material has been delivered. The chemical analysis of this and the Nairobi pipe supply has been satisfactory throughout the year. There are two mains into Nairobi from the reservoir at Kikuyu some 16 miles away. These deliver, respectively in 24 hours, 705,000 and 136,000 gallons. The four reception tanks in the township have a total capacity of 62,000 gallons; the overflow from these at midday is calculated at 36,000 gallons. The structural condition of one of the basins at Kikuyu was not all that could be desired. During the year the Analyst reported the presence of zinc in the water, due to its solvent action on the 4 in. galvanized iron distributing pipes.

Kisumu: is still dependent on the lake water pumped up to the town by the railway. It is high time a gravitation supply was instituted from the neighbouring hills. Streams are available, but the water will have to be filtered before being passed as fit for consumption.

Nakuru: supply is totally insufficient for the growing town, being little more than enough for the needs of the railway yard. Moreover its quality is bad.

Lamu: like Mombasa draws its water from wells and tanks which are polluted and many of the former suspiciously saline.

DRAINAGE.

No advance has been made in Mombasa on the condition reported upon in last year's note. In Nairobi lack of proper drains is conspicuous in all new streets where extensive building operations are vigorously proceeding. Practically no cement drains exist in Kisumu, though the majority of the made streets are provided with open ragged trenches cut out of the "murhum" (iron-stone). This formation is as hard as cement, and the hot sun does not allow the pools to remain long in existence. Such drains as exist are kept indifferently clean by the conservancy gangs. In Nairobi the labour was supplemented by the use of a convict gang. Their operations covered the filling in of 96 borrow pits, 21 excavations, the draining of 60 pools, 6 marshes, the weekly oiling of 50 collections of stagnant water, and the cleaning of 56,000 lineal yards of drains. The railway authorities also did a large amount of useful cleaning in their various quarters.

BUSH CLEARING.

A sum of £500 was spent by the Railway and £300 by the Public Works Department during the year. Owing to labour difficulties this was less efficiently carried out than in former years. Kibuye Point at Kisumu was also dealt with as a sleeping sickness measure.

THE QUESTION OF SEGREGATION OF RACES IN TOWNSHIPS.

Under this heading nothing has been attempted in Mombasa or Nairobi. Though a site was set aside in Nairobi for a native location for this purpose as far back as 1905, owing to lack of means a commencement has not yet been made. In Kisumu a definite area has been reserved for the African employees of the railway. There has been but little invasion of the European residential quarter in Mombasa. The problem of the Indian bazaar in all three towns remains exactly as it did last year. An effort has, however, been made to deal with the small Indian "dukas" springing up in nearly all the new townships and out-stations.

(iv.) CONDITION OF TRADES AND FACTORIES.

PUBLIC MARKETS.

Considering their poor construction and unattractive appearance these have generally been kept in a cleanly condition.

SLAUGHTER HOUSES.

These are under the control of the Administration in all parts of the country except at Nairobi, where it is under the control of the Town Clerk. Most of the meat slaughtered is inspected by the Veterinary Department or by the Sub-Assistant Surgeons of the Medical Department. The latter possess little training for this work. Nairobi killed during the year—

Oxen	...	...	...	...	...	907
Pig ...	...	...	...	...	...	1 (illegally)
Sheep	...	...	...	...	...	33,687

Of these 54 oxen and 482 sheep were condemned as unfit for human consumption.

SODA WATER FACTORIES

Are generally well managed and mostly owned by Asiatics, though the Railway and the European firms have each an up-to-date plant. The sale of the local production in Mombasa is mostly confined to Natives, Europeans generally not caring to risk the chances of contamination; they drink imported aerated waters which adds somewhat to the cost of living. At Kisumu the water for the railway personnel is brought in from the deep water of the Lake in the steamers' tanks and pumped ashore. The analysis of the Mombasa supply has been discontinued, but a watch has been kept on other factories.

COTTON GINNERY.

There is only one in the country, situated at Kisumu. This deals with a large amount of loose cotton coming from Mbale in Uganda, a district known to be endemic with plague. The site of the building is unfortunate; the building is not rat proof.

LAUNDRIES.

The position of these is probably more satisfactory in Nairobi than elsewhere, as the use of pipe water is insisted on.

DAIRIES.

The sale of milk is very largely in the hands of native vendors who are rapidly getting adepts in the art of adulteration. Nairobi is mostly supplied by Europeans on the surrounding farms which are mostly well managed. The condition of the native byres and cattle bomas is best left undescribed. In Nairobi 18 samples were analysed during the year and six were found to be adulterated. An interesting report by the Government Analyst on the quality of milk in East Africa will be found in the Nairobi Laboratory Reports, Vol. iii. Part 2, 1912.

BAKERIES.

Like the milk vendors, the bakers of the country are mostly Asiatics with two or three European firms. With the exception of the Mombasa houses most of these are conducted in a cleanly fashion.

SHIPPING.

A Bill of Health issued at one port holds good for Kilindini, including Mombasa, Lamu and Kismayu. The numbers issued during the year were :—

	1910.		1911.		1912.	
	Steamers.	Dhows.	Steamers.	Dhows.	Steamers.	Dhows.
Kilindini	320	284	381	213	383	110
Lamu	90	3	46	—	18	—
Kismayu	—	—	—	—	—	—

No reason is assigned for a drop in the number of dhows at Mombasa. At Kisumu the numbers were :—

			1910.	1911.	1912.
Steamers			—	—	178
Dhows			—	—	213

(b) MEASURES TAKEN TO SPREAD A KNOWLEDGE OF HYGIENE, &c.

No concerted action has been taken in this respect. In the absence of so much practical application of sanitation methods, the spreading of theoretical knowledge amongst an unlettered, apathetic and ignorant population is futile. Still, the Director of Education has proposed a course of instruction for the schools under his charge, which has since come into force.

(c) RECOMMENDATIONS FOR FUTURE WORK.

With the sanction of His Majesty's Secretary of State the nucleus of a much needed Sanitation Division as a branch of the Medical Department was included in the Estimates for 1912-13, and it duly came into being on April 1st, 1913.

As, since then, Professor W. J. Simpson, C.M.G., has arrived in the country to organise this department, and report on the sanitation of the country, it is deemed advisable not to submit a long list of recommendations most of which will be more adequately dealt with when his report is published. Apart from the sanitation division and its needs, the country will have to face an increase in the medical staff so as to permit those officers who are in charge of hospitals or stations to be so in deed and not merely in name. This many of them cannot be owing to the multiplicity of duties assigned them and the lack of facilities for moving about—concomitant with this will be an increase in the subordinate and clerical staff.

Of buildings the following will be required :—

(1.) ALTERATIONS AND ADDITIONS TO—

The European Hospital, Nairobi.

The Government Laboratory, Nairobi.

The Lunatic Asylum, Nairobi.

Civil Hospital, Nairobi, to include wards for higher caste Indians and Goanese—these two classes, official or unofficial, have literally no semblance of hospital accommodation open to them in Nairobi—coolie wards and African wards.

Several smaller hospitals and dispensaries throughout the country.

(2) NEW BUILDINGS.

European Hospital, Mombasa.

European Hospital, Kisumu.

There are two points bearing directly on the health of officials on which I should like to touch. The first is the housing question. Whatever be the reason it is notorious that there is an insufficiency of either Government quarters which can be allotted to officers on arrival or of—in the bigger centres—houses which can be rented on behalf of the Government. Generally speaking the price demanded for the accommodation offered is such as to preclude its acceptance except through sheer necessity of obtaining roof-shelter. This shortage of supply means the arrangement and endless re-arrangement of houses already occupied: the doubling up of new comers with older residents; or the placing of newly arrived officers in the atmosphere of Clubs or Hotels. To the friction of a tropical climate and the responsibility of his work is added the supreme discomfort of uncongenial home surroundings. Thus it sometimes happens that, consciously or unconsciously, the mental attitude of the officer towards the service he has joined is soured from the commencement.

I would recommend that an adequate provision of houses be made for officials of all ranks; that in Mombasa and Nairobi fully equipped chummeries be built to absorb the bachelors, and available for those coming or going on leave, or who are compelled to visit these towns on short spells of temporary duty.

The other point is the working hours. Government offices close at 4 p.m. (except of course such as from the nature of their work must be open at all hours). With the amazing development of the country it is inevitable that certain departments, in order to overtake the stress of work, should have to work overtime. Against that I have nothing to say; but when the overtime becomes almost a matter of ceaseless routine up to the hours of darkness, I think it should be a subject for enquiry. It is not fair on the clerical staff. The habit of physical exercise and recreation is a very valuable asset towards keeping a man fit and sane—to some absolutely essential. For lack of it, to regain his tone, alcohol is indulged in. Now in this tropical country the only hours in which it is possible to exercise one's muscles and relax the mind by healthful recreation are those between 4.30 and 6 p.m. So far as it can be done, I consider that no office should be kept open after 4.30 p.m.

IV.—METEOROLOGY.

Tables are appended for stations where observations have been taken.

V.—EUROPEAN HOSPITALS.

STAFF.

Dr. W. J. Radford, M.R.C.S., L.R.C.P., was in medical charge of the European Hospital at Mombasa from January to July, when he proceeded on leave.

Dr. A. Robertson, M.B., B.Ch., took over from Dr. Radford and remained in charge till the end of the year.

The Nursing Staff at Mombasa consisted of two Nursing Sisters.

At Nairobi Dr. J. T. C. Johnson, M.B., C.M., F.R.C.S., was in medical charge from January to June, when he proceeded on leave, and Dr. A. Mouat, M.B., B.Ch., D.P.H., L.M., assumed charge.

The Nursing Staff consisted of a Matron and three Nursing Sisters.

The work of the staff at Nairobi Hospital was very heavy on occasions owing to the number of sick and casualties among the Nursing Sisters.

There is great need of a third European Hospital at Kisumu. Much good work was accomplished in the European Hospitals, and the need of them in the country is made very apparent by the increasing use made of them.

TABLE SHOWING ADMISSIONS, AND DEATH RATE OF PATIENTS IN THE TWO EUROPEAN HOSPITALS.

	1911.	1912.
Total number of admissions	230	276
Total number of deaths	14	11
Percentage of deaths to admissions	6·09	3·99
Average number of beds daily occupied	8	11·5
Number remaining on 31st December, 1912	11	14

The principal diseases treated in Hospital were :—

Malaria, 92 cases or 33·33 per cent. of admissions, with in only one case a fatal termination. The tertian, sub-tertian and æstivo-autumnal varieties of the parasite were the prevalent causal agents of the disease. The main incidence of malaria occurred in the 2nd quarter of the year and in July.

Enteric.—This caused 23 admissions, or 8·33 per cent. of the admissions, with four deaths. The cases varied in severity from those of a few days duration which, without the agglutination test, might easily have been overlooked, to cases showing the usual symptoms and complications of a severe infection.

The incidence of this disease is fairly evenly distributed throughout the year.

The greatest number of cases come, as might be expected, from Nairobi with its large European population. (For further information on this subject see Appendix No. I.)

Diseases of Respiratory System.—13 cases, an increase of three cases, compared with 10 for last year.

Dysentery.—10 cases. In this country this disease invariably depends on the amœba. Treatment by emetine hypodermically gives good results, though at the site of the injections considerable redness, irritation and swelling were noticed.

Operations.—Six major and 14 minor operations were performed during the year and some including the setting of fractures. The principal operations performed were for liver abscess, peritoneal cyst, hæmorrhoids, separation of gastric adhesions, intestinal obstructions and appendicitis.

VI.—GOVERNMENT LABORATORY, NAIROBI.

Dr. P. H. Ross, M.R.C.S., L.R.C.P., D.P.H., Government Bacteriologist, proceeded on leave on the 1st January and returned on the 2nd August. Dr. R. Small, M.R.C.S., L.R.C.P., D.T.M., D.P.H., acted as Bacteriologist during the greater period of Dr. Ross's absence.

Mr. V. H. Kirkham, B.Sc., F.I.C., Dip.Agric. (Camb.), was in charge of the analytical branch of the Laboratory throughout the year.

The Bacteriologist performed a large number of routine examinations—2,287 in all—work which is annually becoming a severe tax on his time. This included :—

<i>Blood.</i>							1,505
Widal reaction		negative	...	...	...	...	152
,,		positive...	...	...	...	...	32
<i>Plague.</i>							
Human		positive	...	...	...	...	22
,,		negative	...	...	...	...	27
Rats		positive	...	...	...	...	100
,,		decomposed	...	...	...	...	103
,,		negative	...	...	...	...	771
Urines	...	...	...	...	...	...	116
Cattle	...	...	...	...	...	...	791

The output of glycerinated vaccine lymph for the year was 140,770 doses and dried vaccine for 400 persons.

The standard of successful results obtained was as high and as satisfactory as in previous years. Particulars of the research work carried out in the Laboratory will be found in the Laboratory Reports Vol. III., Parts I. and II., 1912. In this volume will also be found the Report of the first year's working of the Government Analyst. Of the many interesting investigations carried out the following is a summary of those more particularly affecting the Medical Department :—

Milk	...	...	...	...	...	...	...	356
Water	...	...	...	...	...	...	...	85
Food	...	...	...	...	...	...	...	27
Toxicological	...	...	...	...	...	...	...	13
Semen and Blood Stains				...	...	...	...	4
Miscellaneous	...	...	...	...	...	...	...	9

Samples of milk submitted officially :—

Received...	...	...	...	...	...	...	48
Adulterated	...	...	...	...	...	...	18
Percentage adulterated...			...	...	...	...	37.5

VII.—INSTITUTIONS.

LUNATIC ASYLUM.

STAFF.

Dr. A. Robertson, M.B., B.Ch., from January to June; Dr. H. A. Bodeker, M.B., C.M., from June to December; Superintendent, Mr. W. Henfrey; Matron, Mrs. L. Henfrey.

There was a total of 32 males and 4 females admitted during the year, making, with 36 remaining from last year, a total of 72 under treatment as compared with 60 for 1911. During the year there was a mortality of 22, giving the very high death rate of 30·55 per cent. as contrasted with 18·33 per cent. for 1911. Fully half of these deaths occurred in the first quarter of the year, and were due to an outbreak of dysentery. Owing to the shortage of water in the tanks the supply is eked out by the patients being taken down to one of the two streams which flow either side of the grounds for ablutionary purposes. Being Africans they of course drank this highly polluted water, with the above result. Bathing in these streams being put a stop to, no further cases occurred. The high mortality is further explained by the fact that eight deaths occurred in inmates who had been confined in the Asylum for three years and four in those for two years. The cases are sent in from all over the Protectorate and are generally of a very violent nature. They soon quiet down on arrival, and as soon as fit, are occupied in the growing of maize and beans for their own food, and in the upkeep of the grounds. During the year a new wing was added to take in the females, and a European Matron appointed. The accommodation was taxed during the year. One padded cell is reserved for Europeans, but there are no wards for milder or convalescing cases. The water supply is from rain-water tanks, which run short in the dry weather. Proper drainage and electric lighting have yet to be installed.

THE GAOLS.

The two chief ones are at Nairobi and Mombasa. With 634 prisoners remaining from the past year, and with 1,700 admitted during 1912 there were in all 2,334 incarcerations. The sickness ratio was 37·79 per cent. and the death rate 1·67 per cent. The accommodation in both gaols was insufficient. The Mombasa Fort is an unsuitable building, it being extremely difficult to adapt a mediæval fortress on sanitary lines. Nairobi gaol was overcrowded.

CIVIL (NATIVE) HOSPITALS.

Mombasa and Kisumu both possess stone buildings of reasonable design and construction. The management of the former reflects credit on the staff. The Civil Hospital at Nairobi has been condemned since 1904, and is situated on a wrong site, and is most unsuitable. Most of the other stations in the Protectorate are provided with small dispensaries and usually a six bedded ward under the charge of a member of the subordinate medical staff. Tables showing the indoor and outdoor cases treated are appended. The work of these hospitals is greatly impaired by the lack of a trained nursing staff.

RETURNS.

TABLE I.

MEDICAL OFFICERS.

Dr. A. D. Milne	...	...	Principal Medical Officer.
Dr. J. A. Haran, C.M.G.	...		Senior Medical Officer.
Dr. W. J. Radford	...	...	„
Dr. L. D. Lowsley	...	...	„
Dr. H. A. Bodeker	...		Medical Officer.
Dr. C. L. Chevallier	...	...	„
Dr. W. Owen Prichard	...	...	„
Dr. N. M. Leys	...	...	„
Dr. F. L. Henderson	...	...	„
Dr. Small	...	...	„
Dr. A. Robertson	...	...	„
Dr. C. R. H. Chell	...	...	„
Dr. T. F. Lumb	...	...	„
Dr. A. Mouat	...	...	„
Dr. J. L. Gilks	...	...	„
Dr. J. Pugh	...	...	„
Dr. B. W. Cherrett	...	...	„
Dr. R. Hamilton	...	...	Probationary Medical Officer.
Dr. C. J. Wilson	...	...	„
Dr. V. G. L. Van Someren			„
Dr. A. D. J. B. Williams	...		„
Dr. T. H. Massey	...	...	„

OTHER OFFICERS.

Dr. P. H. Ross	...	...	Bacteriologist.
Mr. V. H. Kirkham	...	...	Analyst.

NURSING STAFF.

Miss K. E. Stollard	...	...	Matron, European Hospital, Nairobi.
Miss E. R. Brown	...	...	Nursing Sister.
Miss A. M. Marston	...	...	„
Miss M. MacMillan	...	...	„
Miss D. Turner	...	...	„
Miss H. M. Whitburn	...	...	„
Miss S. E. Lumsden	...	...	„

JUNIOR OFFICIAL STAFF.

Mr. R. Stanley	...	...	Chief Clerk, P.M.O.'s Office.
Mr. T. Preston	...	...	Assistant Clerk „ „
Mr. J. S. Robertson	...	...	Medical Storekeeper.
Mr. G. Gillespie	...	...	Dispenser.
Mr. F. Knott	...	...	„

LUNATIC ASYLUM.

Mr. W. Henfrey	...	...	Superintendent, Lunatic Asylum, Nairobi.
Mrs. L. A. Henfrey	...	...	Matron, Lunatic Asylum,

APPOINTMENTS.

Name.	Appointment.	Date.
Dr. V. G. L. Van Someren ...	Probationary Medical Officer ...	26th April, 1912.
Dr. A. D. J. B. Williams ...	Chief Clerk ...	15th August, 1912.
Mr. R. Stanley ...	Superintendent, Lunatic Asylum	22nd February, 1912.
Mr. W. Henfrey ...	Nursing Sister ...	1st November, 1912.
Miss D. Turner ...	" " ...	5th January, 1912.
Miss H. M. Whitburn ...	" " ...	29th February, 1912.
Miss S. E. Lumsden ...	Temporary Matron, Lunatic Asylum	22nd June, 1912.
Mrs. L. A. Henfrey ...	Assistant Surgeon ...	31st December, 1912.
Mr. H. L. Braganza ...	Sub-Assistant Surgeon ...	22nd January, 1912.
Sukhram Das ...	" " ...	27th March, 1912.
Sheik Abdul Kadir ...	" " ...	11th May, 1912.
G. W. Thatte ...	" " ...	4th August, 1912.
Karam Chand ...	" " ...	24th August, 1912.
Harkishen Das ...	" " ...	17th October, 1912.
Fazel Karim ...	" " ...	26th October, 1912.
J. A. Karveker ...	" " ...	2nd November, 1912.
Ramji Hirji Metha ...	Hospital Compounder ...	2nd July, 1912.
M. P. Mukherjee...	" " ...	1st December, 1912

RESIGNATIONS.

(1.) During tour of service :—

Name.	Appointment.	Date.
Ferozend Din ...	Sub-Assistant Surgeon ...	28th September, 1912.
Brinda Ban ...	" " " ...	28th September, 1912.

(2.) On expiry of agreement :—

Miss E. Crawford ...	Nursing Sister ...	2nd January, 1912.
Miss M. Marshall ...	" " ...	6th March, 1912.
Mr. N. B. Neilan ...	Supt., Lunatic Asylum ...	20th August, 1912.
H. A. Lewis ...	Sub-Assistant Surgeon...	27th December, 1912.
S. F. Ilahi ...	Compounder ...	23rd February, 1912.
M. M. Chettenram ...	" ...	26th November, 1912.

RECALLED TO THE INDIAN ARMY.

Kesar Singh ...	Sub-Assistant Surgeon...	16th February, 1913.
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DEATHS.

A. A. C. Fernandes ...	Hospital Compounder ...	20th April, 1912.
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TRANSFERRED TO HONG KONG.

Dr. J. T. C. Johnson ...	Senior Medical Officer...	12th December, 1912.
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LEAVE OF ABSENCE.

Name.	Rank.	Period Granted.	
		From.	To.
Dr. J. T. C. Johnson	S.M.O.	23rd June, 1912	11th Dec., 1912
Dr. W. J. Radford	S.M.O.	7th July, 1912	23rd Jan., 1913
Dr. P. H. Ross	Bacteriologist	1st Jan., 1912	2nd Aug., 1912
Dr. C. L. Chevallier	M.O.	15th July, 1912	23rd Jan., 1913
Dr. L. D. Lowsley	M.O.	22nd April, 1912	27th Nov., 1912
Dr. W. O. Prichard	M.O.	20th May, 1912	26th Dec., 1912
Dr. J. Pugh... ..	M.O.	13th Aug., 1912	18th Mar., 1913
Dr. B. W. Cherrett	M.O.	7th Oct., 1912	16th May, 1913
Dr. J. L. Gilks	M.O.	15th April, 1912	27th Nov., 1912
Mr. N. B. Neilan	Superintendent, L.A.	22nd April, 1912	20th Aug., 1912
Mr. J. S. Robertson	Medical Storekeeper	22nd April, 1912	29th Oct., 1912
Miss K. E. Stollard... ..	Matron, E.H.	22nd April, 1912	29th Oct., 1912
Miss E. R. Brown	Nursing Sister	2nd Dec., 1912	30th June, 1913

RESUMPTION OF DUTY.

Name.	Rank.	Date.
Dr. P. H. Ross	Bacteriologist	2nd August, 1912.
Dr. R. Small	Medical Officer	26th January, 1912.
Dr. L. D. Lowsley	"	27th November, 1912.
Dr. W. O. Prichard	"	26th December, 1912.
Dr. T. F. Lumb	"	19th March, 1912.
Dr. J. L. Gilks	"	27th November, 1912.
Dr. A. Mouat	"	18th May, 1912.
Mr. J. S. Robertson	Medical Storekeeper	29th October, 1912.
Miss K. E. Stollard	Matron, E. H., Nairobi... ..	29th October, 1912.

TABLE II.

FINANCIAL.

The sanctioned Medical Budget for the year 1912-13 was a total of £33,844 as compared with £29,175 for the previous year. Of this was expended £33,436.

EXPENDITURE.

The headings under which the vote is arranged are as follows :—

SCHEDULE XIV.—MEDICAL DEPARTMENT.

Personal Emoluments £13,881

This includes the salaries of the medical staff, analyst, storekeeper and clerical establishments.

Other Charges £4,248

This covers conservancy rates, the vote for combating epidemic diseases, the proportion of cost of the Zanzibar Quarantine Station, transport and contingencies.

SCHEDULE XIV_A.—MEDICAL DEPARTMENT.

SPECIAL EXPENDITURE SLEEPING SICKNESS.

Personal Emoluments :—Duty Allowances, salaries of subordinates and staff... £407

Other Charges £770

This is to meet the cost of medicines, bush clearing operations, travelling etc

TABLE II.—continued.

SCHEDULE XV.—HOSPITAL AND DISPENSARIES.

Personal Emoluments £8,969

This provides for the cost of the staffs for the European hospitals, lunatic asylum, European dispensers, Indian subordinate medical establishment, and native menial attendants.

Other Charges £5,569

Under this come the charges for the upkeep of the two European hospitals, the laboratory, asylum, such infectious diseases establishments as exist, medical and surgical stores and equipment, transport, etc.

REVENUE.

The gross revenue accruing to the Medical Department amounted to £1,837 16s. 3d., contrasted with £1,408 7s. 9d. for the previous year. The details of this are as follows:—

	£	s.	d.
Fees from European hospitals for subsistence and lodging	1,465	16	3
Expended from Upkeep Vote	976	16	11
(NOTE.—An excess of £276 16s. 11d. over the sanctioned allowance of £700.)			

Thus, the net profit under this head is £488 19s. 4d.

Sales of Bills of Health.	1912.	1911.
	£ s. d.	£ s. d.
Mombasa	194 0 0	193 10 0
Kismayu	22 0 0	23 0 0
Lamu	8 0 0	22 0 0
	£224 0 0	£238 10 0

	£	s.	d.
Sales of medicines, etc., from various dispensaries in districts where no recognised chemist is established	£170	0	0
Registration fees	18	0	0
The net revenue is, therefore	906	19	4

TABLE III.

RETURN OF STATISTICS OF POPULATION FOR THE YEAR, 1912.

	Europeans and Whites.	Africans.	Asiatics.
Number of Inhabitants in 1912	5,151	† 3,000,000	14,644
Number of Births during 1912	85	39	25
Number of Deaths during 1912	45	1,446	364
Number of Immigrants during 1912	3,156	1,990	6,113
Number of Emigrants in 1912	1,220	1,445	3,016
Number of Inhabitants in 1911	* 3,175	† 3,000,000	* 11,886
Increase	1,976	...	2,758
Decrease ... ..	...	...	...

* *Vide* Census 1911. † Approximately.

TABLE III. (A.)

GIVING THE NUMBER OF EUROPEANS IN THE DIFFERENT DISTRICTS.

District.					Males.	Females.	Total.
Machakos	...	...	...	...	53	36	89
Kyambu	...	...	...	...	218	137	355
Kitui	...	...	...	...	5	3	8
Nairobi	...	...	...	...	622	389	1,011
Mombasa	...	...	...	...	198	59	257
Malindi	...	...	...	...	14	1	15
Voi	...	...	...	...	16	12	28
North Kavirondo	...	...	...	...	2	...	2
Kisumu	...	...	...	...	80	36	116
Kisii	...	...	...	...	2	2	4
Nandi	...	...	...	...	12	2	14
Kericho	...	...	...	...	50	13	63
Naivasha	...	...	...	...	319	184	503
Uasin Gishu	...	...	...	...	255	193	448
Ngabotok	...	...	...	...	3	...	3
Eldama Ravine	...	...	...	...	15	6	21
Fort Hall	...	...	...	...	13	9	22
Nyeri	...	...	...	...	58	45	103
Meru	...	...	...	...	3	...	3
Embu	...	...	...	...	6	2	8
Lamu	...	...	...	...	31	10	41
Kismayu	...	...	...	...	26	8	34
Northern Frontier	...	...	...	...	7	...	7
Rabai	...	...	...	...	5	5	10
Shimoni	...	...	...	...	5	1	6
Gazi	...	...	...	...	4	...	4
Total					2,022	1,153	3,175

TABLE III. (B.)

EUROPEAN POPULATION ACCORDING TO AGES.

Ages.								No.
Under 1 year	...	...	...	...	...	...	...	68
1-5 years	...	...	...	...	...	...	...	252
5-10 „	...	...	...	...	...	...	...	204
10-20 „	...	...	...	...	...	...	...	282
20-30 „	...	...	...	...	...	...	...	755
30-40 „	...	...	...	...	...	...	...	850
40-50 „	...	...	...	...	...	...	...	389
50-60 „	...	...	...	...	...	...	...	136
60-70 „	...	...	...	...	...	...	...	28
70-80 „	...	...	...	...	...	...	...	8
TOTAL								2,972

In 203 instances the age is not stated.

(Vide Census 1911.)

TABLE III. (C.)

TOTAL NUMBER OF ASIATICS IN THE EAST AFRICA PROTECTORATE FOR THE YEAR 1912.

Adults.		Children.		Total.
Males.	Females.	Mal. s.	Females.	
6,282	2,231	1,817	1,556	11,886

CLASSIFICATION OF ASIATIC POPULATION.

Class.							No.
Goan ...	...	...	...	...	...	...	1,136
Eurasian	...	...	...	...	...	...	99
Parsi ...	...	...	...	...	...	...	97
Hindu	...	...	...	...	...	...	3,205
Mahomedan	...	...	...	...	...	...	5,939
Others	...	...	...	...	...	...	1,410
Total							11,886

(Vide Census 1911.)

TABLE IV.

SUMMARY OF ROUTINE SANITARY WORK DONE DURING THE YEAR IN THE TOWN OF

1.--NAIROBI.

			Approximate area.		Number of proclaimed open spaces.		
1910	...	...	8½ sq. miles	}	1		
1911	...	...	8½ sq. miles				
1912	...	...	8½ sq. miles				

			Number of Asiatics and Natives.		Number of Europeans.		Total.
			Males.	Females.	Males	Females.	
1910	...	...	6,688	8,351	752	202	15,993
1911	...	...	7,018.	8,645	814	230	16,707
1912	...	...	8,686	9,314	935	265	19,200

3.—HOUSING.

				Number occupied by Europeans.	Number occupied by Natives and Asiatics.
Number of Houses :—					
1910	...	...	...	230	340
1911	...	...	...	254	362
1912	...	...	...	319	463

Number of Huts :—

1910	...	...	...	1,420
1911	...	...	...	1,500
1912	...	...	...	1,549

TABLE IV.—*continued.*

4.—MOSQUITO PROTECTION OF HOUSES.

	1910.	1911.	1912.
Number of European houses wholly mosquito protected ...	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Number of European houses with mosquito room ...	”	”	”
Number rendered during the year wholly mosquito-protected	”	”	”
Number rendered during the year partially mosquito-protected	”	”	”

5.—ERECTION OF NEW BUILDINGS DURING THE YEAR.

	1910.	1911.	1912.
Number of public buildings erected with sanction as to site, construction, and relation to other buildings ...	3	...	3
Number of houses erected with sanction as to site, construction, and relation to other buildings ...	47	63	166
Number of huts erected with sanction as to site, construction, and relation to other buildings ...	45	67	46
Number of houses built without sanction ...	5	...	3
Number of huts built without sanction ...	8	...	...

ACTION TAKEN.

				Number of Prosecutions.		Number Demolished.	
				Huts.	Houses.	Huts.	Houses.
1910	6	12	4
1911	4	18	15
1912	1	...	...

6.—MARKETS.

				Total Number.	Number paved and drained.	Number unpaved.
1910	...	...	...	3	2	1
1911	...	...	...	3	2	1
1912	...	...	...	3	2	1

7.—SLAUGHTER-HOUSES.

				Total Number.	Number paved and drained.	Number unpaved.
1910	...	...	...	1	1	<i>Nil.</i>
1911	...	...	...	1	1	”
1912	...	...	...	1	1	”

TABLE IV.—continued.

8.—LATRINES.

	For Males.		For Females.	
	Number.	Number of Seats.	Number.	Number of Seats.
Number of public latrines :—			Public latrines are only provided for Asiatics and Africans and are used in common by males and females.	There is only one public latrine for Europeans at the railway station.
1910	11	56		
1911	11	52		
1912	8	48		
Number of new public latrines erected during the year :—				
1910	2	8		
1911	1	4		
1912	4	22		
Number of public latrines repaired during the year :—				
1910	4	...		
1911	4	...		
1912	2	...		
Number of public latrines demolished during the year :—				
1910 ... ..	...	...
1911	1	8		
1912	1	6		

	1910.	1911.	1912.
Number of private latrines	820	855	1,400
Average number of pails of night-soil removed daily... ..	1,450	1,481	1,381
Average number of soiled pails removed and clean pails substituted	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Number of night-soil men employed to clean latrines and remove excreta	39	39	43
Number of cesspools	64	81	107
Number of cesspools cleansed daily	64	81	107
Number of new cesspools constructed during the year ... ..	...	17	9
Number of old cesspools abolished	<i>Nil</i>	<i>Nil</i>	1
Number of cesspools oiled regularly by Department	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>

9.—REMOVAL OF REFUSE.

	1910.	1911.	1912.
Number of dustbins	230	245	292
Number of carts at work daily to remove refuse from streets	6	7	16
Amount of refuse removed daily	9 tons	10 tons	20 tons
Number of carts at work daily to remove refuse from yards and premises	7	7	12
Amount of refuse removed daily from yards and premises	4½ tons	5 tons	10 tons
Number of men employed for removing refuse	13	14	54

TABLE IV.—*continued.*

10.—MODE OF DISPOSAL OF EXCRETA, REFUSE AND OFFAL

	Daily average number of pails of excreta.			Daily average number of cartloads of refuse.			Daily average number of cartloads of slaughter house and market offal.		
	1910.	1911.	1912.	1910.	1911.	1912.	1910.	1911.	1912.
Buried or trenched	1,450	1,481	1,000	...	...	...	1	1	2
Burnt ... ..	...	...	...	13	14	50	...	...	...
Thrown into sea ... ..	...	...	...	...	...	...	...	...	...
Otherwise dealt with ... ..	...	...	...	...	...	...	1	1	...

11.—AVERAGE DAILY NUMBER OF CARTLOADS OF TIN CANS,
BOTTLES, BROKEN CROCKERY AND OTHER INCOMBUS-
TIBLE MATERIAL REMOVED FROM HOUSES, HUTS AND
COMPOUNDS.

1910.	1911.	1912.
2	2	35

12.—WATER SUPPLY.

Nature of Water Supply.	1910.	1911.	1912.
Pipe-borne water :—	River and	River and	River and
Source (river, lake or spring)—	Spring	Spring	Spring
Number of linear yards	116,140	116,140	465,500
Number of standpipes along roads	14	12	99
Number of standpipes in compounds and houses	356	405	474
Wells :—			
Public—			
Number	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Number with pumps protected against surface water and mosquito-protected	”	”	”
Private—			
Number	5	8	2
Number protected against surface water and mosquito-protected	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Tanks :—			
Public—			
Number underground	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Number mosquito-protected and served by pumps	”	”	”
Number above ground	”	”	”
Number mosquito-protected	”	”	”
Number of 400-gallons capacity or less	”	”	”
Number above 400 gallons	”	”	”
Private—			
Number underground	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Number mosquito-protected	”	”	”
Number above ground... ..	247	229	255
Number mosquito-protected	247	229	255
Number of 400-gallons capacity or less	102	90	102
Number above 400 gallons	145	139	153
Nature of tanks :—			
Wood	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Iron, Galvanised	247	229	255
Concrete ... ..	...	...	...
Barrels :—			
Number	<i>Nil</i>	<i>Nil</i>	180
Number mosquito-protected	”	”	180

TABLE IV.—*continued.*

13.—DRAINAGE.

Nature of Drainage.								Public.	Private.
Masonry Drains—									
Lineal yards of masonry drains—									
1910	...	...	...	...	...	...	...	4,853	...
1911	...	...	...	...	...	...	...	5,504	...
1912	...	...	...	...	...	...	...	5,804	...
Lineal yards reconstructed during the year—									
1910	...	...	...	...	...	...	...	<i>Nil</i>	...
1911	...	...	...	...	...	...	...	"	...
1912	...	...	...	...	...	...	...	"	...
Lineal yards repaired during the year—									
1910	...	...	...	...	...	...	...	<i>Nil</i>	...
1911	...	...	...	...	...	...	...	"	...
1912	...	...	...	...	...	...	...	"	...
Lineal yards of new drains constructed during the year—									
1910	...	...	...	...	...	...	...	554	...
1911	...	...	...	...	...	...	...	647	...
1912	...	...	...	...	...	...	...	300	...
Earth Drains or Ditches—									
Number of lineal yards of ditches cleansed—									
1910	...	...	...	...	...	...	...	1,867	...
1911	...	...	...	...	...	...	...	3,980	...
1912	...	...	...	...	...	...	...	3,980	...
Number of lineal yards of ditches dug and graded—									
1910	...	...	...	...	...	...	...	<i>Nil</i>	...
1911	...	...	...	...	...	...	...	450	...
1912	...	...	...	...	...	...	...	3,600	...
Average frequency of clearing ditches of grass—									
1910	...	...	...	...	...	...	...	Twice a year	...
1911	...	...	...	...	...	...	...	"	...
1912	...	...	...	...	...	...	...	Monthly	...

14.—CLEARANCE OF UNDERGROWTH, LONG GRASS
AND JUNGLE.

	1910.	1911.	1912.
Number of square yards of weeds, grass and vegetation cut and removed	Information not procurable		About 70,000
Average frequency of clearance of rank vegetation on same area	Twice a year	Twice a year	Monthly

15.—EXCAVATIONS AND LOW-LYING LAND.

	1910.	1911.	1912.
Number of pools and excavations	80	25	237
Number of excavations filled	5	50	21
Amount of low-lying and marsh land raised and drained	<i>Nil</i>	10 acres.	6 acres.
Number of pools, marshes, streams, etc., fish stocked ...	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Number of cubic yards of material used for filling up pools and excavations	Information not procurable.		
Number of persons fined for making new excavations	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Average number of men daily employed in filling up pools, etc.	25	60	60

TABLE IV.—*continued.*

16.—OILING.

	1910.	1911.	1912.
Number of drains oiled	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Number of pools and excavations oiled	12	35	50
Number of tanks and barrels oiled	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Average number of men employed for oiling drains and water-tanks or barrels	2	3	5

17.—INSPECTIONS AND PROSECUTIONS.

	1910.	1911.	1912.
Number of Inspectors employed	2	2	2
Number of houses inspected	25 per day	25 per day	30 per day
Number of houses where larvæ were found	16	22	20
Number of notices served to remove conditions causing the breeding of larvæ	40	60	165
Number of persons fined for having mosquito larvæ on premises	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Number of notices served to remove insanitary condi- tions on premises	280	402	96
Number of persons fined for not removing insanitary conditions after notice	3	8	<i>Nil</i>
Number of soda and aerated water factories inspected	3	3	4

TABLE IV. (A.)

1.—SUMMARY OF ROUTINE SANITARY WORK DONE DURING
THE YEAR IN THE TOWN OF MOMBASA.

	Approximate Area.	Number of proclaimed Open Spaces.
1910	} Island, 3,470 acres ... Native town, 270 acres	} 1 public garden. Area, 1·8 acres.
1911		
1912		

2.—POPULATION.

			Number of Natives.		Number of Europeans.		Total.
			Males.	Females.	Males.	Females.	
1910			Approx. 25,750		167	51	Approx. 26,000
1911			,, 26,000		213	55	,, 26,500
1912			,, 26,500		224	62	,, 26,786

TABLE IV. (A.)—*continued.*

3.—HOUSING.

Number of Houses :—	Number occupied by Europeans.			Number occupied by Natives.		
1910 	90			910		
1911 	90			927		
1912 	91			954		

Number of huts :—

1910 	3,100
1911 	3,182
1912 	3,244

4.—MOSQUITO PROTECTION OF HOUSES.

	1910.	1911.	1912.
Number of European houses wholly mosquito-protected ...	None	None	None
Number of European houses with mosquito room 			
Number rendered during the year wholly mosquito-protected			
Number rendered during the year partially mosquito protected			

5.—ERECTION OF NEW BUILDINGS DURING THE YEAR.

	1910.	1911.	1912.
Number of public buildings erected with sanction as to site, construction, and relation to other buildings ... ...	...	...	...
Number of houses erected with sanction as to site, construction, and relation to other buildings 	15	17	28
Number of huts erected with sanction as to site, construction, and relation to other buildings 	147	127	157
Number of houses built without sanction 	1	...	...
Number of huts built without sanction ... ... ...	...	...	...

N.B.—“Sanction” granted is without reference to any sanitary standard, which is ignored.

ACTION TAKEN.

				Number of Prosecutions.		Number Demolished.	
				Huts.	Houses.	Huts.	Houses.
1910	3	14	...
1911	1	45	2
1912	85	...

TABLE IV. (A.)—continued.

6.—MARKETS.

	Total number.	Number paved and drained.	Number unpaved.
1910	3	2	1
1911	3	2	1
1912	3	3	1

7.—SLAUGHTER-HOUSES.

	Total number.	Number paved and drained.	Number unpaved.
1910	3	2	1
1911	3	2	1
1912	3	2	1

8.—LATRINES.

	For Males.		For Females.	
	Number.	Number of seats.	Number.	Number of seats.
Number of Public Latrines :—				
1910... ..	...	...	...	...
1911... ..	1	2	...	...
1912... ..	4	5	...	3
Number of new Public Latrines erected during the year :—				
1910... ..	...	...	...	...
1911... ..	1	2	...	...
1912... ..	3	3	...	3
Number of Public Latrines repaired during the year :—				
1910... ..	...	...	...	...
1911... ..	None	...	...	...
1912... ..	None	...	...	...
Number of Public Latrines demolished during the year :—				
1910... ..	...	...	...	...
1911... ..	None	...	...	...
1912... ..	None	...	...	...

	1910.	1911.	1912.
Number of Private Latrines	180	189	190
Average number of pails of nightsoil removed daily	216	305	310
Average number of soiled pails removed and clean pails substituted	None	None	None.
Number of nightsoil men employed to clean latrines and remove excreta	14 About	18 About	18 About
Number of cesspools	2,000	2,000	2,000
Number of cesspools cleansed	None	None	None.
	About	About	About
Number of new cesspools constructed during the year ...	100	125	125
	About	About	About
Number of old cesspools abolished	10	40	40
Number of cesspools oiled regularly by Department	None	None.	None.

TABLE IV. (A.)—continued.

9.—REMOVAL OF REFUSE.

	1910.	1911.	1912.
Number of dustbins	9	9	9
Number of carts at work daily to remove refuse from streets	12	13	13
Amount of refuse removed daily	10 tons	11 tons	12 tons
Number of carts at work daily to remove refuse from yards and premises	1	1	1
Amount of refuse removed daily from yards and premises ...	$\frac{1}{2}$ ton	$\frac{3}{4}$ ton	1 ton
Number of men employed for moving refuse	98	102	104

10.—MODE OF DISPOSAL OF EXCRETA, REFUSE AND OFFAL

	Daily average number of Pails of Excreta.			Daily average number of Cartloads of Refuse.			Daily average number of Cartloads of Slaughter-house and Market Offal.		
	1910	1911	1912	1910	1911	1912	1910	1911	1912
Buried or trenched ...	...	...	...	...	...	...	...	...	...
Burnt ... ..	...	...	...	17	20	24	...	...	...
Thrown into sea ...	216	305	310	3	4	2	150 lbs.	200 lbs.	225 lbs.
Otherwise dealt with ...	...	...	...	$11\frac{1}{2}$	13	14	...	...	...

11.—AVERAGE DAILY NUMBER OF CARTLOADS OF TIN CANS BOTTLES, BROKEN CROCKERY AND OTHER INCOMBUSTIBLE MATERIAL REMOVED FROM HOUSES, HUTS AND COMPOUNDS.

	1910	1911	1912
	1	$1\frac{1}{2}$	$1\frac{1}{2}$
Thrown into sea			

TABLE IV. (A.)—*continued*.

12.—WATER SUPPLY.

Nature of Water Supply.	1910	1911	1912
Pipe-borne water :—			
Source (river, lake or spring)—			
Number of linear yards	None	None	None
Number of stand-pipes along roads	None	None	None
Number of stand-pipes in compounds and houses ...	None	None	None
Wells :—			
Public—			
Number	28	28	28
Number with pumps protected against surface water and mosquito-protected.	None	None	None
Private—			
Number	86	90	93
Number protected against surface water and mosquito-protected	None	None	None
Tanks :—			
Public—			
Number underground ... ..	...	...	...
Number mosquito-protected and served by pumps ...	...	...	...
Number above ground	2	2	2
Number mosquito-protected ... ..	...	...	...
Number of 400 gallons capacity or less	2	2	2
Number above 400 gallons ... ..	...	...	...
Private—			
Number underground... ..	65	70	73
Number mosquito protected	Unknown	Unknown	Unknown
Number above ground... ..	20	20	20
Number mosquito-protected ... ..	...	Unknown	Unknown
Number of 400 gallons capacity or less ... ..	...	...	...
Number above 400 gallons ... ..	...	...	...
Nature of tanks :—			
Wood ... ..	...	...	...
Iron ... ..	...	20	25
Concrete ... ..	...	70	70
Barrels :—			
Number ... ..	...	About 1,000	About 1,000
Number mosquito-protected ... ..	...	None.	None.

TABLE IV. (A.)—continued.

13.—DRAINAGE.

Nature of Drainage.									Public.	Private.
Masonry Drains :—										
Lineal yards of masonry drains :—										
1910	...	...	...	...	...	...	...	...	320	...
1911	...	...	...	...	...	...	...	...	360	...
1912	...	...	...	...	...	...	...	...	360	...
Lineal yards reconstructed during the year :—										
1910	...	...	...	...	...	...	...	...	...	...
1911	...	...	...	...	...	...	...	...	...	...
1912	...	...	...	...	...	...	...	...	...	...
Lineal yards repaired during the year :—										
1910	...	...	...	...	...	...	...	...	...	...
1911	...	...	...	...	...	...	...	...	Approx. 150	...
1912	...	...	...	...	...	...	...	...	50	...
Lineal yards of new drains constructed during the year :—										
1910	...	...	...	...	...	...	...	...	Approx. 40	...
1911	...	...	...	...	...	...	...	...	...	...
1912	...	...	...	...	...	...	...	...	30	...
Earth drains or ditches cleansed—Number of lineal yards of ditches cleansed :—										
1910	...	...	...	...	...	...	...	...	...	...
1911	...	...	...	...	...	...	...	...	None	...
1912	...	...	...	...	...	...	...	...	None	...
Number of lineal yards of ditches dug and graded :—										
1910	...	...	...	...	...	...	...	...	...	...
1911	...	...	...	...	...	...	...	...	None	...
1912	...	...	...	...	...	...	...	...	None	...
Average frequency of clearing ditches of grass :—										
1910	...	...	...	...	...	...	...	...	None	...
1911	...	...	...	...	...	...	...	...	None	...
1912	...	...	...	...	...	...	...	...	None	...

14.—CLEARANCE OF UNDERGROWTH, LONG GRASS AND JUNGLE.

	1910.	1911.	1912.
Number of square yards of weeds, grass and vegetation cut and removed	} Approx. 100 acres	Approx. 150 acres	Approx. 150 acres.
Average frequency of clearance of rank vegetation on same area			
	6 months	6 months	6 months

TABLE IV. (A.)—*continued*.

15.—EXCAVATIONS AND LOW-LYING LAND.

	1910.	1911.	1912.
Number of pools and excavations	None	None	None
Number of excavations filled up			
Amount of low-lying and marsh land raised and drained ...			
Number of pools, marshes, etc., fish-stocked			
Number of cubic yards of material used for filling up pools and excavations			
Number of persons fined for making new excavations ...			
Average number of men daily employed in filling up pools, etc.			

16.—OILING.

	1910.	1911.	1912.
Number of drains oiled	A few hundreds	A few hundreds	A few hundreds
Number of pools and excavations oiled			
Number of tanks and barrels oiled			
Average number of men daily employed for oiling drains, pools, and water tanks or barrels	8	8	8

17.—INSPECTIONS AND PROSECUTIONS.

	1910.	1911.	1912.
Number of Inspectors employed	2	2	2
Number of houses inspected ... ..	...	...	173
Number of houses where larvæ were found ... ..	...	...	Uncounted
Number of notices served to remove conditions causing the breeding of larvæ ... ..	...	...	<i>Nil</i>
Number of persons fined for having mosquito larvæ on premises	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>
Number of notices served to remove insanitary conditions on premises	103	75	165
Number of persons fined for not removing insanitary conditions after notice ... ..	...	...	1
Number of soda and aerated water factories inspected	4	3	3

TABLE V.
STATION—MOMBASA.

Longitude, 39° 42' E. Latitude, 4° 4' S. Height above Sea Level, 60 ft.

1912.	Mean Pressure at 32° at Station Level. 9 a.m.	AIR TEMPERATURE.								HUMIDITY 9 A.M.			AMOUNT OF CLOUD.	RAINFALL.			WEATHER, No. of Days of (9 A.M.)		
		9 a.m.	Means of		Min. & Max. Combined.	Absolute Min. & Max.				Dep. of Wet Bulb.	Vapour Pressure.	Percentage.	9 a.m.	Total.	Max.	Date.	Rain.	Hail.	Thunder.
			Min.	Max.		Min.	Date.	Max.	Date.										
January ...	29·988	82·0	74·5	85·8	80·1	71·9	27	88·2	2	6·3	ins.	%	0-10	ins.	ins.	2	2	...	...
February	29·956	82·0	75·1	85·0	80·1	70·9	7	88·9	5	5·4	...	...	5·0	3·27	1·72	6	6	...	...
March ...	29·972	84·3	76·0	87·0	81·5	72·6	2	90·2	20	5·9	...	...	4·1	2·12	0·88	24	7	...	...
April ...	29·961	82·1	74·9	84·5	79·7	73·2	19	87·2	1	5·1	...	...	5·1	12·61	3·12	16	15	...	...
May ...	30·020	82·2	74·3	83·7	79·0	71·8	31	85·0	28	4·9	...	...	4·8	2·20	0·54	3	13	...	...
June ...	30·073	80·2	72·6	82·8	77·7	68·0	26	85·0	10	5·3	...	...	4·8	0·52	0·12	23	11	...	...
July ...	30·090	77·9	70·5	80·5	75·5	68·0	11	82·0	30	5·3	...	...	5·2	1·40	0·59	4	6	...	...
August ...	30·098	77·1	70·5	79·7	75·1	68·0	13	81·6	28	4·0	...	...	5·3	2·94	0·75	12	19	...	...
September	30·057	78·8	71·4	81·2	76·3	69·0	16	82·7	25	4·2	...	...	4·2	1·63	0·54	14	13	...	...
October ...	30·057	80·6	73·0	83·0	78·0	70·2	1	85·3	25	5·4	...	...	4·1	1·24	0·70	18	11	...	...
November	29·984	81·4	73·9	82·9	78·4	71·2	6	84·5	1	4·6	...	...	4·6	5·98	2·38	21	15	...	...
December	29·981	82·2	73·9	84·1	79·0	72·2	19	85·5	18	4·8	...	...	4·5	3·35	1·22	18	16	...	...
Year ...	30·020	80·9	73·4	83·3	78·4	68·0	{ 26 June 11 July 13 Aug. }	90·2	20 Mar.	5·1	...	...	4·7	37·58	3·12	16 Ap.	134	...	...

TABLE V. (A).
STATION—NAIROBI (KABETE).

Observer :—Manager.
Longitude, 36° 43' 41" E. Latitude, 1° 14' 30" S. Height above Sea Level, 5,750 ft.
Height above ground of :—Thermometers, 4' 0". Rain gauge, 1' 3".

		°	°	°	°	°				°	ins.	%	0-10	ins.	ins.				
January ...	...	...	51·2	75·5	63·3	44·0	16	79·8	15	5·3	...	...	4·2	0·94	0·43	5	7	...	...
February	...	...	53·5	75·7	64·6	40·8	16	83·4	17	3·4	...	...	6·0	13·90	2·62	7	19	...	...
March ...	...	...	53·7	75·5	64·6	49·8	21	79·8	8	5·1	...	...	4·9	3·51	1·77	2	10	...	...
April ...	...	...	54·5	74·1	64·3	50·2	25	77·8	8	4·3	...	...	6·3	12·19	1·59	18	22	...	...
May ...	...	...	54·7	72·0	63·4	49·4	18	76·0	3	4·7	...	...	7·1	7·35	1·24	24	19	...	...
June ...	...	...	50·2	73·7	61·9	44·6	30	81·5	13	4·5	...	...	5·9	5·34	3·88	29	9	...	...
July ...	...	...	48·8	68·2	58·5	42·5	8	76·0	14	2·6	...	...	8·5	0·28	0·22	31	3	...	...
August ...	...	...	49·4	69·1	59·3	42·5	19	77·0	19	3·9	...	...	7·8	0·50	0·16	13	6	...	...
September	...	...	49·4	74·9	62·1	42·5	21	82·0	11	4·2	...	...	4·2	1·46	0·70	11	5	...	...
October ...	...	...	52·3	78·4	65·4	43·0	2	82·0	23	5·0	...	...	5·3	0·13	0·12	5	2	...	...
November	...	...	54·3	73·3	63·8	45·0	2	82·5	6	2·1	...	...	8·4	5·06	0·73	16	17	...	...
December	...	...	54·1	70·0	62·0	47·5	24	76·0	9	2·6	...	...	7·1	5·19	0·94	1	21	...	...
Year ...	...	...	52·2	73·4	62·8	40·8	16 Feb.	83·4	17 Feb.	4·0	...	...	6·3	55·85	3·88	29 June	140	...	...

TABLE V. (B).
STATION—KISUMU.
Longitude, 34° 44' E. Latitude, 0° 7' S. Height above Sea Level, 3,800 ft.

		°	°	°	°	°				°	ins.	%	0-10	ins.	ins.				
January ...	...	...	66·7	88·4	77·5	63·0	9	95	22, 25, 30	...	...	...	...	1·22	0·51	31	7	...	...
February	...	...	66·2	83·6	74·9	63·0	10	91	2	...	...	...	...	4·30	2·97	20	8	...	...
March ...	...	...	66·7	85·1	75·9	64·0	1	89	12, 13, 26	...	...	...	...	5·96	1·33	7	14	...	...
April ...	...	...	66·1	81·1	73·6	64·0	{ 7, 24, 25, 28, 29 }	86	10	...	...	...	...	10·11	2·17	4	20	...	...
May ..	...	...	65·5	83·0	74·2	62·0	30	91	3	...	...	...	...	4·80	2·50	9	9	...	...
June ...	...	...	64·6	79·7	72·2	61·0	5	82	{ 1, 2, 3, 5, 8, 9, 11 }	...	...	...	...	3·07	0·92	11	12	...	...
July ..	...	...	64·0	79·2	71·6	61·0	7, 8, 13	82	9, 23, 31	...	...	...	...	2·92	1·70	21	9	...	...
August ...	...	...	62·7	81·6	72·2	60·0	20, 24	97	17	...	...	...	...	5·14	1·35	30	11	...	...
September	...	...	63·7	82·7	73·2	60·0	14, 21	89	27	...	...	...	...	0·69	0·28	29	6	...	...
October ...	...	...	65·8	86·0	75·9	62·0	21	92	24	...	...	...	...	1·09	0·37	28	7	...	...
November	...	...	65·2	84·9	75·0	62·0	3	89	10	...	...	...	...	4·89	1·24	11	14	...	...
December	...	...	65·6	85·3	75·0	62·0	16	92	6, 11, 13	...	...	...	...	2·09	0·78	18	7	...	...
Year ...	...	...	65·2	83·4	74·3	60·0	{ 20 } Aug. { 24 } { 14 } Sept. { 21 }	97	17 Aug.	...	...	...	...	46·23	2·97	20 Feb.	124	...	...

RETURN OF DISEASES AND DEATHS (IN-PATIENTS)

DISEASES.	REMAINING IN HOSPITAL AT THE END OF 1911.												YEARLY TOTAL.																
													ADMISSIONS.																
	European Hosp., Mombasa.	European Hosp., Nairobi.	H.M. Prison, Mombasa.	Mombasa Native Civil Hospital.	Nairobi Lunatic Asylum.	Nairobi Native Civil Hosp.	Kisumu Native Hospital.	Dispensary, Fort Hall.	Nakuru Hospital.	Lamu Native Hospital.	Infect. Diseases Hosp., English Pt., Mombasa.	Various Dispensaries.	3rd K.A.R., Nairobi.	Marsabit Dispensary.	European Hosp., Mombasa.	European Hosp., Nairobi.	H.M. Prison, Mombasa.	Mombasa Native Civil Hospital.	Nairobi Lunatic Asylum.	Nairobi Native Civil Hosp.	Kisumu Native Hospital.	Dispensary, Fort Hall.	Nakuru Hospital.	Lamu Native Hospital.	Infect. Diseases Hosp., English Pt., Mombasa.	Various Dispensaries.	3rd K.A.R., Nairobi.	Marsabit Dispensary.	
INFECTIVE DISEASES:—																													
Anthrax																	1	1			1								
Beri-beri																		5		169	16			35	1				
Chicken Pox						2												2								44	25		
Cow Pox																													
Dysentery				1	1	1	1					5	3		3	7	2	100		80	11	1	14	1		114	10	1	
Enteric		3	1												2	17				3							1		
" (Paratyphoid)															3														
Gonorrhœa												1	2				4	23		6	4	2	16			17	12		
Influenza																										2			
Leprosy (Anæsthetic)						1														2	1	1							
" (Nodular)																										1			
Malaria (Æstivo-Autumnal)		1		5			2						2		1	35		407		48				4		44	101	1	
" (Blackwater)															1			2		1						7	3		
" (Chronic Malaria)																7										4			
" (Quartan)																				2						12			
" (Tertian)	1											2			47	1	147		15	97	49	25			890				
Mumps			2													1	4		3		1								
* Plague																		3		35					4				
Pneumonia				1			3								11			31		33						34	3		
Relapsing Fever																			6		1								
Rheumatic Fever						1						3			6	4	7		3	6	1	2				19	10		
Septicæmia																					1					1			
Trypanosomiasis (Sleeping Sickness)						1						3								7		1				6			
** Small Pox																		6		2			3		85	17			
Syphilis (Primary)												1	1			1	11		3	6	1	32			25	11			
" (Secondary)			2			3	5		2			2				2	4		16	23	2	9			33	9			
" (Tertiary)															1														
" (Inherited)															1											4			
Tetanus				1														5					1			1			
Tuberculosis						1										3	10		5	3	1	4	1			12	1		
Yaws																		4		4	1	1				18			
Other Diseases																			18										
INTOXICATIONS:—																													
Alcoholism																2				2						1			
GENERAL DISEASES:—																													
Anæmia												1								6	3			1		15			
Exophthalmic Goitre																				1									
Other General Diseases						2													14			3				6			
LOCAL DISEASES:—																													
Diseases of the Nervous System:—																													
Chorea																1													
Delusional Insanity																	1			1						2			
Dementia																	2		2										
Epilepsy																		1		1	2								
Hysteria																													
Insanity																													
Mania																	10				1								
Melancholia																1	1												
Meningitis																		1		1			1						
Myelitis																			2				2						
Neuralgia																										72	3		
Neurasthenia																2													
Neuritis																													
Paralysis																													
Other Nervous Diseases				1														8		2	1						7	1	
Mental Diseases:—																													
Males:—																													
Dementia																			11										
Delusional Insanity																			1										
Idiocy																													
Mania																													
Melancholia																													
Observation																			10										
Females:—																													
Delusional Insanity																			1										
Idiocy																			2										
Mania																			1										
Diseases of the Eye:—																													
Cataract												2														3			
Conjunctivitis				1											2	1	25	5		1	2	3				10	5		
Iritis																				1	2		1			1			
Keratitis																					5					3			
Opacity of Cornea																		1											
Ulceration of Cornea																													

* The above total does not include 23 cases of Plague reported dead or segregated in their houses in town, during the year 1912.

** The above total does not include 202 cases of Small Pox notified and segregated in their houses in town during the year 1912.

* Transferred to the Lunatic Asylum, Nairobi.

TABLE VI.—RETURN OF DISEASES AND DEATHS

DISEASES.	REMAINING IN HOSPITAL AT THE END OF 1911.													YEARLY TOTAL.														
														ADMISSIONS.														
	European Hosp., Mombasa.	European Hosp., Nairobi.	H.M. Prison, Mombasa,	Mombasa Native Civil Hospital.	Nairobi Lunatic Asylum.	Nairobi Native Civil Hosp.	Kisumu Native Hospital.	Dispensary, Fort Hall.	Nakuru Hospital.	Lamu Native Hospital.	Infect. Diseases Hosp., English Pt., Mombasa.	Various Dispensaries.	3rd K.A.R., Nairobi.	Marsabit Dispensary.	European Hosp., Mombasa.	European Hosp., Nairobi.	H.M. Prison, Mombasa.	Mombasa Native Civil Hospital.	Nairobi Lunatic Asylum.	Nairobi Native Civil Hosp.	Kisumu Native Hospital.	Dispensary, Fort Hall.	Nakuru Hospital.	Lamu Native Hospital.	Infect. Diseases Hosp., English Pt., Mombasa.	Various Dispensaries.	3rd K.A.R., Nairobi.	Marsabit Dispensary.
Brought forward ...	1	4	9	9	36	10	13	1	4	...	...	20	8	...	59	97	207	645	36	411	269	64	150	9	89	1426	201	3
LOCAL DISEASES—continued.																												
Diseases of the Ear:—																												
Abscess	1	...	1	...	...	...	...	...	...	...	...	...	...	...
Inflammation	1	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	...	2	...	...	...	...	...	...	1	...
Other Diseases	2	...
Diseases of the Nose:—																												
Epistaxis	1	...	...
Diseases of the Circulatory System:—																												
Aneurism	1	...	...	1	...	...
Endocarditis	1	...	1	...	...	...	...	...	...	...	...
Suppurative Phlebitis	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Valvular Mitral...	1	3	...	...	...	1	2	...	...	...	1	...	...
Aortic	2	...	...	...	...	...	...	...	...	...	1	...	...
Pulmonary	1	...	...
Other Diseases	1	...
Diseases of the Respiratory System:—																												
Abscess of the Lung	3	...	...
Asthma	2	...	6	...	...	...	...	...	...	...	...	...	...
Bronchitis	1	3	...	...	...	...	...	...	...	8	11	11	...	72	21	1	13	2	...	...	64	18	...
" Catarrhal	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Broncho-Pneumonia	3	...	...	2	...	...	2	...	...	1	...	5	...	103	6	6	22	...	...	...	54	27	...
Empyema	1	...	...	...	...	...	...	...	...	...	...
Laryngitis	2	...	...	...	...	...	...	...	...	...	2	1	...
Phthisis
Pleurisy	1	...	...	1	...	1	...	...	...	...	...	1	...	1	...	9	...	1	4	...	...	...	5	1	...
Pneumothorax	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Other Respiratory Diseases	2	...	...	2	3	...	...	...	...	...	9	...	...
Diseases of the Digestive System:—																												
Abscess	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...
" of Liver	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Appendicitis	5	...	...	...	...	...	...	...	...	...	...	...	...
Ascites	1	1	...	...	...	...	...	1	...	1	...	...
Caries of the Teeth	1	...	...	...	...	...	...	...	8	...	...
Cholecystitis (suppurative)	1	...	...	...	...	...	...	...	...	...	...	...	...
Cirrhosis	1	...	1	...	...	...	...	...	...	...	...	1	...
Colic	2	...	3	8	...	2	...	...	...	...	...	17	...	...
" Biliary	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Colitis	2	...	...	...	...	...	...	...	...	...	...	...	...	...
Constipation	1	1	...	...	2	...	...	...	...	11	1	...
Diarrhoea...	2	1	...	1	2	...	...	...	...	2	...	...	2	1	24	54	...	9	14	6	12	...	...	100	3	...
Dyspepsia	1	...	...	...	...	2	...	...
Enteritis	1	...	...	...	...	...	...	1	...	...	...	...	...
Fissure of Anus...
Fistula in Ano	1	...	...	...	...	...	...	...	...	...	...	...	...
Gastritis	1	...	...	...	...	...	...	...	...	5	...	...	...	2	...	...	1	...	...	1	1	...
Glossitis	1	...	2	...	...	...	...	...	1	...	...
Hæmorrhoids	1	...	...	...	3	...	...	...	...	...	...	...	...	...	1	...	...
Hepatitis (Acute)	1	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	2	...	...	...	...	...	3	...	...
Hernia	4	...	2	...	...	...	...	...	...	...	...
" Strangulated	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Inflammation of Tonsils	3	2	...	1	...	...	...	...	...	...	4	1	...
Jaundice	1	...	...	...	...	...	...	...	...	...	...
Pancreatitis	1	...	...	...	...	...	...	...
Peritonitis	1	...	...	...	1	...	...	...	...	...	...	...	...
Sore Throat	1	...	...	...	...	...	...	...	...	1	...
Stomatitis	1	...	2	...	2	...	...	...	...	...	...
Ulceration of the Stomach	1	...	...	...	...	...	...	...	...	...	...	...	...
Other Diseases	2	...	...
Diseases of the Lymphatic System:—																												
Elephantiasis	1	...	1	...	...	...	...	...	...	...	...
Inflammation of Lymphatic Gland	2	3	5	...	1	4	...	1	...	...	2	...	...
Lymphangitis	1	...	...	...	...	...	1	4	...
Splenitis	1	...	...	...	...	...	...	...	...	...	1	3	...	2	2	...	...	...	...	5	...	...
Suppuration of Lymphatic Gland	2	...	...	...	...	...	...	...	...	...	...	...	...	13	...	6	5	...	...	...	...	...	3	...	...
Diseases of the Urinary System:—																												
Acute Nephritis...	2	...	...	...	...	...	...	2	...	...
Bright's Disease	3	...	10	...	1	...	...	...	...	...	...	...	...
Cystitis													

[illegible]

TABLE VI.—RETURN OF DISEASES AND DEATHS

[illegible]

† Recorded under respective Diseases.

[illegible]

TABLE

RETURN OF DISEASES (OUT

DISEASE.	Nairobi.		Fort Hall Dispensary.		Native Hospital, Mombasa.		Jail Hospital, Mombasa.		Native Hospital, Nakuru.	
	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.
INFECTIOUS DISEASES :—										
Chicken Pox	5	...	3	...	...	...	...	...	...	...
Cow Pox ... ..	...	...	...	...	285	34	...	...	...	...
Dysentery	179	1	3	3	46	7	2	...	34	3
Gonorrhœa	110	...	7	...	142	1	12	...	38	...
Influenza	9	...	2	...	...	...	...	...	23	...
Kala Azar ... ..	...	...	...	...	...	...	...	...	...	...
Leprosy	1	...	1	1	...	...	...	...	1	...
Malaria	589	1	805	80	1,448	119	104	2	171	9
Measles	8	...	...	...	...	...	...	...	...	...
Mumps ... ..	...	...	1	...	...	...	...	...	...	...
Plague ... ..	...	...	...	...	...	...	...	...	1	...
Pneumonia ... ..	...	...	...	...	...	...	...	...	...	...
Pyrexia of Uncertain Origin ... ..	...	...	...	...	...	...	...	...	...	...
Relapsing Fever ... ..	...	...	...	...	...	...	...	...	...	...
Rheumatic Fever ... ..	...	...	35	4	64	14	8	...	..	...
Septicæmia ... ..	...	...	...	...	...	...	...	...	...	...
Small Pox... ..	...	...	2	...	...	...	...	...	...	...
Syphilis	187	12	12	21	39	4	13	...	57	8
Tetanus ... ..	...	...	...	...	...	...	...	...	...	...
Tuberculosis	5	...	...	...	6	4	...	...	4	...
Whooping Cough	3	...	...	...	...	...	...	...	...	...
Yaws ... ..	...	...	1	...	14	...	1	...	...	...
Other Infective Diseases	20	...	...	...	...	...	...	...	...	...
INTOXICATIONS :—										
Alcoholism ... ..	...	...	...	...	...	...	...	...	...	...
Morphinism ... ..	...	...	...	...	...	...	...	...	...	...
Other Intoxicants ... ..	...	...	...	...	...	...	...	...	...	...
GENERAL DISEASES :—										
Anæmia	8	...	...	...	...	...	8	...	...	...
Anæmia—Pernicious ... ..	...	...	4	...	...	...	...	...	...	...
Diabetes ... ..	...	...	...	...	...	...	...	...	...	...
Gout	3	...	...	...	...	...	...	...	...	...
Hodgkin's Disease ... ..	...	...	...	...	...	...	...	...	...	...
Purpura ... ..	...	...	...	...	...	...	...	...	...	...
Rickets ... ..	...	...	...	...	1	...	...	...	...	...
Scurvy ... ..	...	...	1	...	1	...	...	...	2	...
Other General Diseases	90	5	...	...	...	...	2	...	8	...
Debility ... ..	...	...	...	...	4	3	...	...	...	...
LOCAL DISEASES :—										
Diseases of the Nervous System	333	3	14	2	123	12	12	1	15	2
„ „ „ Eye	189	14	97	87	197	24	64	2	39	17
„ „ „ Ear	125	4	7	2	124	20	33	1	17	3
„ „ „ Nose	33	...	88	7	393	39	1	...	1	...
„ „ „ Circulatory System ... ..	...	...	...	...	1	...	...	...	4	...
„ „ „ Respiratory „	1,871	20	231	49	349	35	297	21	271	30
„ „ „ Digestive „	1,641	49	363	73	1,248	142	295	13	310	36
„ „ „ Lymphatic „	76	1	10	1	77	7	20	...	6	...
„ „ „ Urinary „	2	...	...	...	3	...	2	...	...	...
„ „ „ Generative „	35	5	3	...	72	4	18	...	6	3
„ „ „ Organs of Locomotion	206	1	9	...	73	3	52	6	51	2
„ „ „ Connective Tissue	114	1	25	5	119	16	21	...	42	3
„ „ „ the Skin	1,194	42	272	20	1,614	121	167	...	56	10
Injuries ... ..	...	...	...	...	...	...	...	...	...	...
Injuries—General ... ..	...	...	...	...	...	...	...	...	1	...
Injuries—Local	2,061	46	1,211	413	940	47	159	4	404	25
Poisons... ..	...	...	...	...	3	...	...	...	...	...
„ (Snake Bites) ... ..	...	...	...	...	...	...	...	...	...	...
Tumours ... ..	...	...	...	...	...	...	...	...	...	1
Parasites	39	1	...	...	89	13	...	...	7	...
„ Animal ... ..	...	...	...	...	...	...	9	...	...	...
TOTAL	9,136	206	3,207	768	7,475	669	1,300	50	1,569	152
SURGICAL OPERATIONS ... ..	...	...	...	...	359	42	...	...	105	...

VII.

PATIENTS) FOR THE YEAR 1912.

Native Hospital, Lamu.		Native Hospital, Kismayu.		Native Hospital, Kisumu.		3rd King's African Rifles.		Marsabit Dispensary.		Moyale Dispensary.		Various Dispensaries.	
Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.
2	...	1	...	...	...	...	...	...	...	...	...	150	1
...
9	...	45	3	70	7	47	8	...	...	...	...	432	75
34	1	14	...	46	2	3	...	...	...	...	...	327	8
...	...	...	...	...	...	...	...	...	...	...	...	57	8
...	...	...	...	1	...	...	...	...	...	...	...	...	...
3	1	...	...	4	...	...	...	...	...	...	...	5	1
268	56	105	4	828	64	352	40	98	1	47	7	4,913	596
...	...	...	...	...	...	...	...	...	...	...	...	3	...
...	...	1	...	5	...	...	...	...	...	...	...	...	...
...	...	...	...	30	18	...	...	...	...	...	...	3	1
...	...	17	...	10	2	...	...	...	...	...	...	20	2
29	6	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	16	...
64	13	3	...	44	11	46	3	...	...	...	...	587	87
...	...	...	...	2	...	...	...	...	...	...	...	...	...
...	...	5	...	...	...	...	...	...	...	...	...	1	...
34	5	9	1	140	17	9	...	1	...	7	2	336	111
2	1	...	...	...	...	...	...	...	...	...	...	2	...
13	6	19	...	4	2	1	...	...	...	...	1	11	5
...	...	...	...	1	...	4	...	...	...	...	...	1	...
12	3	2	...	5	1	...	...	...	...	...	...	72	33
...
...	...	...	...	...	...	...	...	...	...	...	...	1	2
1	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	2	...
8	7	6	1	7	1	16	...	...	...	...	...	171	38
...	...	1	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	1	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	2	...
...	...	...	...	...	...	...	...	...	...	...	...	1	...
...	...	...	...	...	...	...	...	...	...	...	...	2	...
5	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	6	...	1	...	13	...	...	...	...	...	27	1
...	...	...	...	4	...	15	...	...	...	...	...	255	19
...
76	33	100	12	122	12	258	46	6	...	3	...	1,097	99
74	12	44	8	175	62	78	25	4	...	69	18	1,218	427
40	6	7	1	69	6	82	25	3	...	10	2	534	92
10	1	...	...	16	3	...	...	...	...	...	...	157	5
13	1	1	...	4	1	...	...	...	...	...	...	13	4
227	37	122	7	704	84	606	96	22	3	29	3	4,562	854
477	115	335	49	650	69	465	134	46	3	39	5	5,608	907
24	2	20	...	78	5	61	1	...	...	...	...	397	42
8	...	...	...	6	1	...	...	...	...	1	...	26	2
51	18	14	4	21	19	57	17	3	1	1	1	130	64
41	6	9	...	162	12	218	2	...	...	9	2	1,084	102
40	2	39	5	58	8	133	8	12	...	...	1	712	73
461	81	97	10	550	72	1,039	130	2	...	9	5	4,414	513
...	...	...	...	...	...	...	...	81	2	91	12	...	...
...	...	...	...	35	5	...	...	...	...	...	...	94	17
197	16	144	20	1,190	64	546	41	...	...	...	...	13,738	1,349
...	...	2	...	...	...	...	...	...	...	...	...	11	5
...	...	...	...	2	...	...	...	...	...	...	...	...	...
9	2	...	...	...	...	1	...	...	...	...	2	16	2
79	15	...	...	40	4	20	...	4	...	1	1	845	72
...	...	27	7	...	...	...	...	...	...	...	...	...	...
2,313	446	1,195	132	5,084	552	4,071	576	282	10	316	62	42,053	5,617
4	...	2	...	...	...	53	...	...	...	...	...	...	...

APPENDIX I.

No. 114.

HEALTH OFFICE.
NAIROBI, 20th April, 1912.

SIR,

In compliance with your letter No. 28/529/1, dated the 20th March, 1912, we have the honour to submit herewith our Report on the results of our inquiry into the causes which gave rise to the recent cases of enteric fever in Nairobi, together with a draft Circular embodying some information on the disease, as well as recommendations which, if adopted, will tend to the prevention of its spread, and which we would suggest be printed and copies thereof distributed among the inhabitants of the township.

We have been assisted in every way by the patients and their friends, and the help thus received we would gratefully acknowledge.

A perusal of the Report will show that we have been unable to proceed beyond a question of probability. Starting with a knowledge of the fact that enteric fever exists to an unknown extent in Kikuyu, and that the people of that country constitute the bulk of the unskilled labour, we find that Mr. W—— (CASE 1) employs many casual workmen, whose personnel frequently changes, and who are liable to disappear, as often as not, when overtaken by illness. He is accustomed to handle their implements, with a view to demonstrating their better use, and has recalled the fact that he has subsequently, at times, proceeded to food without preliminary ablution. The possibility of his having thus contracted the disease from one of his men, is rendered the more probable by the fact of his having taken his meals, during the time under review, with his brother and the brothers M——, two of whom would later appear to have derived their infection from a source, other than that of the food they partook of in common.

Mr. W——'s two brothers subsequently developed the affection, one, apparently, without doubt from the soiling of his fingers with the contents of a vessel, which held infected excreta, and the subsequent omission to perform an ablution, and the other probably in the same manner.

Mrs. W—— and her children failed to contract the disease, the former, because she carried out the medical attendant's instructions carefully, and the latter, because they were not permitted to have anything to do with the patient.

Mr. M—— (one of the two brothers alluded to above, CASE 3) may have derived his infection from the same source, although the time which intervened between his departure from Nairobi, and the development of the disease, seems somewhat long. Both he and his brother lived together during almost the whole of their shooting trip, their food and drink being practically the same. The porters who accompanied them could not, unfortunately, be examined, so, though we suspect that the origin of the disease may be found among them, yet we have not been in a position to prove or disprove the supposition. The blood of the brother who remained free gave, on examination, a negative Widal reaction.

Mr. M——'s (CASE 6) work brought him into contact with an M'ganda, who had previously suffered from the disease, and he was accustomed to wash his hands in cold water, and cleanse his teeth through the medium of the same basin. It is possible that he even omitted at times the act of ablution prior to meals, and it is interesting to note that his messmate did not contract the disease, has never, so far as he knows, had it, and that his work did not bring him into contact with the M'ganda referred to.

Mr. S—— and Mr. G—— (CASES 7 and 8) were accustomed, up to the end of February, to mess at Mrs. P——'s house in company with a number of others, the vast majority of whom have never had enteric fever. Mr. S—— indulged in weekly shooting trips, and when engaged on such, was given to drinking of any water he happened upon. The blood of his personal servant, however, gave a positive Widal reaction on examination, and a possible inference may be that he infected his master. Mr. G—— must have been infected in some similar manner, as owing to his habit of partaking of his food with others who remained unaffected, the possibility of his having contracted the disease in this fashion may be eliminated.

Mr. E—— (CASE 6) is a case of a solitary appearance of the disease in a susceptible household, and it is to be regretted that his cook had left Nairobi, before we had the opportunity of examining him.

The Goanese children (CASES 11, 12, 13, 14), the Indian child, and the Indian postman, would seem to have derived their disease from hands soiled by infective matter—at least as far as their histories and habits can lead us to formulating a probability.

Mr. R—— (CASE 9) contracted the disease, either here or in the Seyidie Province. While journeying in the latter place, he was accompanied by two others, who acted in the same manner as he did, and who did not subsequently develop typhoid fever. At Nairobi his mode of life is methodical, he never consumes uncooked food, and his milk is boiled. We have not had the opportunity of examining the bloods of either his servant or his porters.

In conclusion, we would submit that the sporadic manner in which the disease has manifested itself, and the existence of associates in connection with all the cases who shared in their ways of food, and yet remained unaffected, would seem to point to the patients having derived their affection as the result of their hands, and consequently their food, having been contaminated by infected matter.

We have the honour to be,

Sir,

Your obedient servants,

(Sd.) J. A. HARAN, S.M.O.,

(Sd.) ALEXANDER ROBERTSON, M.O.H.

REPORT ON CASES OF ENTERIC FEVER IN NAIROBI BETWEEN OCTOBER, 1911, AND MARCH, 1912.

Mr. W——, (CASE 1) Victoria Street, developed the disease about the 10th of December.

Movements prior to attack.—He returned from a holiday in England at the end of August; was in Uganda for a fortnight in the middle of October. Between his return from Uganda and the date of attack he resided continuously on his farm at Athi Plains, about five miles from Nairobi, coming into Nairobi to his workshop in the morning, and returning to his farm in the late afternoon.

Habits.—He has breakfast and dinner at the farm, he lunches in a room adjoining his office in Victoria Street, the food for lunch being brought in from the farm in the morning and consisting chiefly of cold meat and bread. The food for lunch is not kept in a safe. He says that he never eats uncooked vegetables.

He drinks either stout or milk at lunch, the latter being brought in from the farm in a bottle each morning. In the evening he usually has a whisky and soda, the soda water being procured from Mackinnon Brothers, who get it in the first instance from the factory of Intiazali. He had lunch at the Norfolk Hotel about a week before his illness; but he partook of nothing uncooked.

The workshop and offices are situated in Victoria Street, behind the Stanley Hotel. There is a passage on one side of the building, which Natives frequently use for purposes of defæcation, etc.

Mr. W—— was in the habit of handling the implements used by the Indian and Native labourers. Mr. W—— states that his native labourers frequently left his service at the end of a month.

The water supply is from a standpipe in Government Road, and is the ordinary town supply.

The dwelling house at the farm is new, the water supply for drinking and cooking is from two large galvanized iron tanks placed above the ground, while for washing purposes the water is procured from a cement tank underground.

The garden, in dry weather, is watered by means of a watering can, the water for this purpose being got from the river, which is distant about 400 yards from the farm.

The milk supply is under the personal supervision of his wife and brother.

Mr. A. W—— (CASE 2) a brother of the above, took ill about 20th January, 1912. He was employed in the Agricultural Department; but had his lunch each day with his brother at his office in Victoria Street, and during his brother's illness, he frequently looked in at the workshop to see how the work was going on. He was also, sometimes, in attendance on his brother at the farm, during his illness. His habits were pretty much those of his brother.

CASE 3.—A third brother, who resided continuously on the farm, developed the disease at the end of January. He had been, very frequently, in attendance on his two brothers during their illness, and assisted in removing stools, etc.

Mrs. W——, and the two children, have not developed the disease. Several of the boys employed at the farm and workshop, were sent to the Laboratory, with a view to having their blood examined; but a negative result was got in each case.

CASE 4.—An Indian Mistri, employed by Mr. W——, in his workshop in Victoria Street, developed enteric about 20th February. He had been in Mr. W——'s service for over three years. About three years ago he was superintending the erection of a building at Kikuyu, and after he had been there about eight days, he developed fever and diarrhoea, which he says lasted for over a fortnight. As an overseer his work takes him a lot into the surrounding country, and he says he has been in the habit of drinking from streams and pools of stagnant water. He resides at the workshop in Victoria Street, cooks his own food, and never eats anything uncooked, except perhaps fruit.

CASE 5.—Mr. M—— took ill, while away on safari in the Fort Hall District, about the middle of January. He had resided with the W——'s on their farm, and lunched with Mr. W—— in his office also. He left on safari with his brother about the middle of December. While on safari he drank from pools of stagnant water and from streams. His brother did not develop the disease even though his habits were much the same.

CASE 6.—Mr. M—— took ill on the last Monday in January. He worked at B. E. A. Saw Mills, and resided on their premises near the Public Works Department. He had all his meals on the premises; he says that he never partakes of any food that is uncooked. He usually drinks lime juice and soda. His milk supply is from Masai milk sellers; the milk is boiled. An M'ganda boy employed at the mill was often in attendance on Mr. M—— during the working hours, and this boy was ill with diarrhoea and fever about the end of December.

A Widal reaction of this boy's blood was positive. Large numbers of natives are in the habit of using the ground in the vicinity of the Mill as a public latrine.

CASE 7.—Mr. S—— took ill about the 8th of March. He was employed in a local bakery, and resided in a room at the back of the bake-house. He had his meals at the boarding house, managed by Mrs. P—— in River Road. He had tea in the bake-house each morning, the tea being made and brought by a boy employed by his employer. Mr. S——'s personal servant, though he gave no history of illness, gave a positive Widal reaction when his blood was examined. Mr. S—— was in the habit of going out twice a week to the Athi Plains to shoot, and on these occasions he was not regular as to what water he drank.

Mrs. P—— had enteric fever, about 20 years ago, while resident in South Africa.

About 15 persons had meals regularly at Mrs. P——'s in River Road, and of this number three had had enteric fever in South Africa in former years.

CASE 8.—Mr. G—— took ill about the 14th March. He resided with Mr. R—— his partner, in a house in Duke Street. He had been up at Lumbwa for a day or two at the end of February; he dined at Nakuru, and had a glass of water to dinner, slept one night at Londiani, and had breakfast there. On his return from Lumbwa, he was at Ngong for part of a day; but took sandwiches and a bottle of mineral water. He spent one day at Ruiru, where he lunched; but drank no water. He changed his servant a week or two before he took ill. He had meals with Mrs. P—— until he went to Lumbwa, about the end of February, and on his return, about March 1st, he had his meals in the Stanley Hotel. He says that he rarely eats salads or uncooked vegetables. The servants at the house in Duke Street were sent to the Laboratory; but each gave a negative Widal reaction.

CASE 9.—Mr. R—— took ill at the end of December. He had been in Nairobi during the whole of November, and went to Shimba Hills on the 12th December, returning to Nairobi about the 18th. He drank from stagnant pools of water on the way to Shimba; but when in Mombasa he only used Perrier water. His milk supply is from Dr. M——'s dairy, and this is boiled; he never eats uncooked vegetables.

CASE 10.—Mr. E—— took ill about the 8th March; but continued at work for over a week before he went to bed. He returned from leave in November last, and had not been out of Nairobi since his return. He usually drinks whisky and soda, lime juice and soda, and water from standpipe in the compound, which is filtered. He gets his soda water supply from Souza Junior, who procures it in the first instance from Imtiazali. He had an M'ganda cook, whom he discharged about a fortnight before he took ill. He sometimes eats salads. He got the vegetables from a European farm in the vicinity, but a fortnight before he took ill, this supply of vegetables from —— became rather short, and he supplemented the supply from the native Jeewanjee market. Two of his personal servants were examined; but both gave a negative Widal reaction.

CASE 11.—An Indian child, living in the Railway Landies, and aged about 3 years, took ill on the 27th March. The milk supply from Masai, water supply from a tap in the compound, all food is cooked, and the milk was said to be boiled. Fruit is sometimes purchased from the Jeewanjee Market. The child was in the habit of playing in the drains at the landies.

CASE 12.—An Indian, by the name of H——, employed in the Post Office, was ill with enteric fever in the month of October. He prepared his food himself, which was all cooked. He got his milk supply from a Somali, his water supply is from a tap, but he was in the habit of washing his clothes in water from the irrigation trench.

CASES 13 and 14.—Two Goanese children, living in the Railway quarters, developed the disease early in April. The milk supply was from a Somali milk seller, who delivered the milk at the house, each day. This milk supply was suddenly stopped about three days before the children took ill. Previous to this condensed milk was used. Water supply from public standpipe.

From the histories of the cases of enteric fever, the following deductions may be drawn :—

WATER SUPPLY.

One cannot possibly attribute the causation of these cases to the public water supply, since an infection, following such, would be widespread, more especially as the water is neither boiled, nor filtered, by the majority of householders.

With regard to the drinking of water from pools and streams, a history of which is given by at least three of those attached, namely Messrs. R——, M—— and S——, it is obvious that this cannot be disregarded, and is a possible cause of the disease in these three cases.

It is interesting to observe, however, that Messrs. R—— and M—— were accompanied by others, who practically ate and drank in the same way, and yet did not develop the disease.

MILK.

The milk supplied to those attacked, with the exception of the brothers W——, was from different vendors. This article of food cannot be well regarded as the cause of the disease since were such the case it would probably have assumed wider proportions.

It is, however, known that milk boys are frequently in the habit of washing empty milk bottles and milk cans in the irrigation trench in Swamp Road, and in other pools and streams that intervene between Nairobi and the various dairies. In many cases, also, it is quite possible for boys to open bottles containing fresh milk, abstract some of the milk, and add water to make up the deficiency. In cases where milk cans are locked, this cannot be done, nor can the cans be washed anywhere but at the dairy.

NOTE.—A system of locked cans, and the provision of stoppers to bottles, that cannot be tampered with is greatly to be desired. The dangers in washing bottles and cans in pools and streams in this country are undoubtedly not remote, since pollution of the water with various bacteria is now well known, and this contamination is continuous, on account of the habit that the native has of defæcating and micturating here, there, and everywhere. In a letter from Dr. Arthur of the Kikuyu Mission, we have been able to elicit the information that enteric fever is by no means unknown amongst the natives in and around the Mission Station, which, by the way, is not far from the source of the Nairobi River. In 1909 there were three cases treated in the Mission Hospital, and last year there were nine others. The cases treated in Hospital, most probably, form only a small proportion of those infected.

FLIES.

It is well known that the infection of enteric fever can be carried to food by means of ordinary house flies. Though one must keep this in view as a possible cause, we can submit nothing very definite in support of the opinion, that flies were the agents which gave rise to the recent cases.

CARRIER.

The most probable cause of the sporadic cases referred to is he who is known by the name of the "carrier." With an infected native population, some of those who have had the disease may still have the infective germs in their bodies, from which they are emitted in the discharges from the bowel and bladder.

With regard to the individual cases, it is very probable that Mr. W—— contracted the disease from a "carrier," and that he ultimately infected his two brothers, and the Indian Mistri in his employ.

With regard to Mr. M—— (CASE 5), the two brothers were living under similar circumstances, and why one should contract the disease from drinking water that may have been polluted, and the other escape, can possibly be ascribed to a certain degree of natural immunity in the one, which was not existent in the other. It is possible that Mr. M—— contracted the disease through the agency of a "carrier," which was not operative in the case of the brother. He may have obtained his infection from Mr. W——, with whom he stayed, though the incubation period is somewhat long, should this be the case.

With regard to Mr. M—— (CASE 6), it is very likely that he contracted the disease through a "carrier" in the person of the M'ganda boy who assisted him at his work. The two other Europeans, who messed with him, did not develop the disease, so that we cannot attribute the infection in his case, either to milk, water, or the agency of flies.

Two possibilities exist in the case of Mr. S——, either, that he derived his disease from polluted water, or by means of the native who was his personal servant, and who gave a positive Widal reaction, even though he could give no history of illness.

With regard to Mr. G——, it is possible that he may have contracted the disease outside Nairobi. It is unfortunate, however, that his personal servant should have left his employment a fortnight or so before his illness commenced, thus preventing us from interrogating him. Mr. R—— probably acquired his infection after his return from Shimba. It is possible that he contracted the disease on his journey there, through drinking polluted water, though the two officers who accompanied him, and lived under the same conditions, did not, as far as we know, develop the disease.

In the case of Mr. E——, the possibility that he derived the infection from the M'ganda cook, who he dismissed a fortnight before he took ill, must not be forgotten, although he gives a history of having eaten uncooked vegetables bought in the Jeewanjee Market, most of which are watered by means of irrigation streams derived from the Nairobi River, which is known to be polluted. The latter alternative, however, should have led to the disease appearing among the members of his family. The source from whence the Indian child, who resides at the Railway Landies, derived his infection, seems difficult to arrive at with certainty. We can only say that it is a common custom, for children of his age and class, to play in the adjacent drains, as well as on the ground adjoining their dwellings. If these habits are considered in conjunction with the almost universal practices of natives, as regards micturition and defæcation, the possibility of his having acquired the disease through contaminated hands, would seem to be the most probable one. As regards the two Goanese children, we have learnt that their parents commenced to purchase milk from an itinerant vendor, some 15 days before the former took ill.

The parents, however, assert that the milk was always boiled before use, and that their food is invariably cooked before use. Their servant, who had been in their employment for a considerable time, had left at the end of the previous month, and we were, consequently, unable to interrogate him. It was not possible to obtain any information as to the whereabouts of the milk vendor, who had ceased calling, and it was not absolutely certain that the children might not have drunk the milk unboiled.

Against the possibility of the milk having been the medium of conveyance, is the fact that no other cases have appeared having the same history. We can, thus, only surmise that they derived the disease as a result of their habits of play, and the resultant contamination of their food. In the case of H——, we have been informed that he lives close to the irrigation channel, and was accustomed to wash his clothes with water drawn therefrom. (In this connection, we may invite attention to the possibility of rains washing the overflow from the latrines at the Civil Hospital, into the same channel, a short distance above where he resides, and the consequent danger of resulting infection of the water.) Had he derived the disease from this source, we should have expected to meet with other cases from the same area, although, individual habits must be remembered. He asserts that all his food was invariably cooked. From a consideration of the circumstances attending all these cases, we have come to the conclusion that the majority, if not all of them, were probably due to contamination of food, resulting from the hands of the patients having become infected by contact with matter containing the germs of Enteric Fever.

APPENDIX II.

EAST AFRICA PROTECTORATE.

MEDICAL DEPARTMENT.

CIRCULAR No. 130.

ENTERIC FEVER.

Brief Notes on its Causes and Prevention.

As cases of Enteric or Typhoid Fever have occurred in the Protectorate the following information regarding the occurrence of the disease may be of interest to you.

It is caused by the entrance into the body of a special microbe. This can be brought about by :—

- (1) direct or indirect contact with a person suffering from the disease or with a "Carrier."

NOTE :—A "Carrier" is a person who has had an attack of typhoid fever, and who, otherwise perfectly healthy and able to follow his avocation, yet continues to excrete the microbe.

- (2) Water which has been contaminated with the excreta from a case of the disease,

- (3) Food which has been contaminated in the same manner, or

- (4) The retention of infective matter in the neighbourhood of dwellings.

"The most frequent mode of infection is by contact or by the mouth, the virus either being contained in water, milk or other food, or conveyed directly by the unwashed hands after contact with infected matter." (*Whitelegge and Newman.*)

"In connection with infection contracted from filth or through food the agency of flies must not be forgotten. The domestic house fly and other forms have been proved to be carriers of contamination on their antennæ and legs." (*Niven quoted by Whitelegge and Newman.*)

The disease varies in its severity, some cases being of so mild a character that the patient may continue to pursue his daily avocations, being only conscious of a slight sense of ill-being. Such a person is none the less capable of transmitting the disease to others.

A consideration of the above facts makes it clear that the disease is largely, if not entirely, avoidable, and the following hints may be of service towards this end, *viz.* :—

- (1) The hands should always be carefully washed before partaking of food, the water for the process being obtained from a reliable source and, preferably, hot.

- (2) A special vessel should be maintained for the holding of the water where-with the mouth and teeth are cleansed. The water for these processes should be obtained from a reliable source and be, preferably, boiled before use.

- (3) Uncooked foods, such as salads, should be avoided, unless their origin are unimpeachable. It would be best to allow no food to come to the table which has not been cooked.

- (4) Milk should be boiled beforehand. Fruit should be peeled. Foods such as cold meats, milk, bread, etc., should be stored in fly-proof places when not actually on the table.

- (5) The cleanliness of the latrines and closets attached to a house should be rigorously attended to and a box of earth should be kept in each of these places. Whenever a place of the kind has been used, sufficient earth to completely cover the deposit should be subsequently added by means of a scoop.

- (6) The occupier of a house should see that his servants or their visitors are not allowed to micturate or defæcate on the ground attached to his residence. A favourite place for the former performance is that which adjoins the back of the kitchen. The grounds surrounding a building should be kept trim and free from undergrowth as the absence of cover discourages these practices.

(7) The cleanliness of the kitchen and its contents is a matter which needs constant supervision. The "Mtoto wa Jiko" is prone to scour his pots and pans in the earth and ashes adjoining the sphere of his operations, and, as he or his friends may perhaps select the same site for micturating at night, the possibilities of the combination are obvious.

(8) Servants should wash their hands thoroughly before being permitted to attend at table. Their clothes and the quarters occupied by them should be always clean.

(9) The grounds surrounding a building should be kept free from accumulation of garbage, manure, refuse, and other filth, as the presence of these materials encourages the breeding of flies.

(10) When flies invade a building immediate steps should be taken to destroy or drive them out.

(11) Where laneways or unoccupied plots in the township are noticed to be used for purposes of micturition, etc., the Police authorities should be notified of the fact.

(12) Water should not be drunk which has been drawn from pools or streams unless it has been boiled previous to use.

(13) Tanks used for the storage of rain water should be of the overground variety and be furnished with taps.

APPENDIX III.

REPORT ON BERI-BERI AT SERENLI. DECEMBER 1911 TO MAY 1912.

In presenting a report on the recent epidemic of Beri-Beri at Serenli, I will follow an unusual order and describe first the mode of onset, course, symptoms, and measures taken to cope with the disease and then discuss the vexed question of causation, incubation period, possible causes of such a high mortality, and finally offer recommendations for the future.

ONSET.

As usual the first cases were likely to be overlooked, the symptoms amounting only to slight pain and swelling on the legs. As early as November, two or three such cases occurred, but it was not realised until the second week in December that a definite epidemic of Beri-Beri had to be dealt with.

The number of soldiers with these preliminary symptoms rapidly increased.

SYMPTOMS.

It has often been noticed that the symptoms of Beri-Beri vary considerably in different epidemics and in different cases in the same epidemic. So much is this the case with regard to different epidemics that it seems not unlikely, that in our present state of want of knowledge, different diseases have been and are now lumped together under this "blessed word" Beri-Beri.

Now one fact stands out most conspicuously in this epidemic.

The uniformity of the symptoms.

The first signs of œdema have not been in the feet, though these swelled later, but on the outer side of the upper third of the tibia, or rather between the tibia and fibula. The pitting on pressure in this region though slight is quite perceptible in the very early stages. About the same time pain is noticed in the thigh muscles, especially the adductors, and very soon the calf muscles are also affected. In slight cases these pains amount only to a feeling of stiffness. Lieut. Davies, 3rd K.A.R., tells me that often on parade a man would complain in the first instance of pain in one knee and limp slightly. This is interesting, as a one sided lameness would have put me on a wrong scent.

The patella reflex is lost very early; a preliminary increase might reasonably be expected, but, possibly through not examining soon enough, I have been unable to obtain it. These symptoms in the lower extremities have usually developed sufficiently to give rise to the so called beri-beri gait.

Some puffiness under the eyes and sometimes on other parts of the face may be present.

In fact I want to lay stress on the apparent insignificance of the symptoms so far described. Yet this epidemic has been characterised by a very high and sudden mortality. The serious symptoms, leading almost invariably to a fatal result, must now be described.

The most distressing fact all through has been the way the poison seems to have made a bee line for the vagus nerve, or more correctly, when once affected the attack on the nerve has been sudden and severe. Many of the cases which have been considered quite slight for a month or more have, from some unexplained cause, suddenly developed cardiac and stomach symptoms with rapidly fatal results.

Though writing with a very small experience, yet it seems to me extraordinary that we have had so few cases of moderate severity lasting a considerable time. I have seen no typical "wet" or "dry" cases judged by a text book standard, none to correspond to those severe cases often seen in home hospitals for tropical disease, no really extensive dropsy and no extreme wasting.

The suddenness of the heart symptoms may perhaps have led to a fatal issue before the signs of back pressure could become developed, but one might expect some of the slighter cases, which have been hanging on now for nearly three months, to show more of the effects of neuritis. They walk with a stick, still complain of stiffness and some pain, the knees jerk is still absent, but the wasting is very slight.

Stomach and cardiac symptoms appear nearly simultaneously. Often after two or three days' constipation a full meal could no longer be easily digested. Pain in the chest, palpitation and some dyspnoea quickly supervene. Then the fight for life begins, and though, as has been already stated, nearly always unsuccessful, one cannot but admire the splendid efforts some of the patients made.

In fact it almost seemed as if the actual condition of the heart had less to do with prolonging life than the character of the patient and conditions producing a moral effect upon him. This is specially noticeable by the way the patients died in batches. If after a hard struggle a popular sergeant died, his death was rapidly followed by three or four more, then a pause for some days, only to be followed by another lot of deaths one after another.

To return to these final symptoms :—

Persistent vomiting and retching nearly always set in some hours or a day or two before death.

Marked anæsthesia of the lower limbs, though not complete, was always present at this stage, and then all the well-known symptoms of an extremely dilated and failing heart brought on a fatal termination.

The physical signs included most puzzling and varied cardiac murmurs, generally systolic; largely increased cardiac dullness to right side, but to my surprise without a marked displacement of the apex beat outside the nipple line, though this was often much lower than is normally the case.

MEASURES TAKEN TO COPE WITH THE EPIDEMIC.

In a letter written to the Officer Commanding, Serenli, on February 22nd, after my arrival I wrote :—

“In December you telegraphed to me and as the disease continued you kept me informed. I recommended that rice should be discontinued (this you have already done), that rest was essential and that a light and varied diet was useful for the sick. At my request you sent me daily messages. Though eight men had died, after three weeks the epidemic seemed to be subsiding as you reported that there were no more deaths and no more new cases. However, after about a week you reported more cases and five more deaths with no improvement in the old cases, so I decided, with the consent of the Provincial Commissioner, to visit Serenli. Leaving Kismayu on January 29th, I arrived at Dekatch on February 13th, inspected 32 sick, and reached Serenli on the 15th, where the new cases in a few days had amounted to over 20. Out of a total strength of 117 (this was before the Inspector-General's escort returned), you have had over 70 cases and up to the present 18 deaths.

“In moving those of the sick able to travel to this camp 35 miles south, I think that you have done right, but I do not think that the immediate transfer of these men by road to Yonti is advisable. Even if you can provide camels, the journey would be too much for them and you must expect a further large mortality.

“During the few days that I have been here and at Serenli, I can see little or no improvement in the condition of the more serious cases, and some of the slight cases have developed into serious cases, but it seems to me that we can only do as well as possible in this camp, until a steamer arrives to relieve the men.

“Everything which I have suggested, you have or are trying to carry out. It is important that if possible you should employ more labour, as the men are unable to work for themselves, to build shelters, etc., the rains being expected next month.

“Since my arrival the river has risen a few inches, and though this is probably only a temporary rise, it is advisable that the Provincial Commissioner be asked to send a steamer as soon as possible.

“With regard to food supplies to the troops, I considered the rations inadequate and unsuitable, and at my request you have ordered more and procured some locally.

“It seems to me that in those out-stations where Government have to ration the troops, care should be taken that the food is at least as varied as that supplied to prisoners in Mombasa or Nairobi Jails.”

This letter shows that by stopping the issue of rice, improving the rations and in moving the sick we were making efforts to stay disease. How ineffectual and inadequate these measures proved to be will be shown. The fact is that, when this river is not navigable, it is difficult to imagine a more unsatisfactory situation in which to cope with a disease of this kind.

One can now realise in the days of long sea voyages the helplessness and despair created by ship beri-beri. Our condition was little better. There seemed to be no escape, Much the most important measure after an outbreak is to remove the sick to a higher altitude. but here our only water supply is the Juba river and we are but 400 ft. above sea level. A move to any hills to the north would have cut us off still further from our base of supplies and was in other ways quite impracticable.

At Dekatch, to my surprise, I found that the sick, if it met with my approval, were to go on to Yonti by road. Having examined the men and knowing the road it seemed impossible to recommend such a journey at that time. That rest and careful nursing is needed in this disease has long been impressed upon me, and the great danger of any sudden movement or strain.

The condition of the heart in the majority of these 32 men showed that they were quite unfit to travel.

The track across to Afmadu means a daily double journey from 4.0 a.m. to 8.30 a.m., and again for similar hours, if possible, in the evening (necessary with a limited camel transport through waterless country). Such marching combined with a swelling mid-day heat would be a great strain on an enfeebled heart. It seemed madness to send the men; yet now it seems to me that I was probably wrong to stop them. Surely, the mortality would not have been higher than which we afterwards had at Dekatch (see Mortality Table), and which we had to watch sitting down.

The camp at Dekatch was not satisfactory. It was situated under the shade of dôm palms and other large bush trees right on the bank of the river. The bank here was, fortunately, high above the water. It would have been worse to have moved on to the bare stoney rising ground away from the river as we had not the necessary labour, time and material to build suitable huts. On my arrival, the camp was much improved, Lieutenant Orr having enlarged, cleared and generally cleaned up the place. Every man was provided with a fixed bedstead about two feet from the ground, made on the spot of wood and grass, with plenty of room between them. A shelter was built over each, but no side walls were allowed so as to admit as much fresh air and light as possible. Two cooks were employed making soup and gruel for the very sick and for those who were fit enough, meat, ghee, dates and onions, when obtainable, were added to the rations.

At Serenli, on the first symptoms, the soldier was excused duty, fatigues were stopped at an earlier hour in the morning and began later in the afternoon. The men were encouraged to bring their bedsteads into the open air directly there was any shade.

After my arrival the lines were thoroughly cleared out and cleaned, the large number of boxes and kit, beloved by the Sudanese lady, was overhauled. In this connection I will mention here that before my arrival only one case had occurred among the women, but after the quarters were cleared out and cleaned cases became common, though happily not so severe as in the case of men. Up to the present we have had 19 female cases with 5 deaths.

Sub-Assistant Surgeon Iman Bakhsh informs me that the women are much more likely to conceal their illness than the men.

TREATMENT.

From the Medical Officer's point of view this is the most unsatisfactory part of this report. In this epidemic I do not know of a single case which has been saved by medicines, nor for certain by treatment of any kind; nor am I sure that anyone has been prevented from contracting the disease by any measures which we have taken. My journey up here has been, as far as one can see, without any beneficial results. As will be seen directly, in discussing the etiology, I do not wish to underrate the value of discontinuing rice as a ration, nor the importance of considering white (especially polished) rice as an essential cause of the disease; but in this epidemic my theory is that the disease was contracted in a short time in the last half of November, long before my arrival, and that nothing short of moving the whole of these troops would have had any effect.

Medicines were very very disappointing. Cardiac tonics and stimulants were tried one after the other with the exception of Nitroglycerine, but they seemed to increase the distress of the patients and became distinctly unpopular. The only medicine in great demand at Dekatch Camp was a strong highly flavoured Mist. Alba.; for those who could still eat well an iron and arsenic mixture was given but was seldom well borne. Syr.: Ferri Phosphat. is proved to be an excellent tonic to a very weak convalescent from a slight but long standing attack.

ETIOLOGY.

RICE.—When the bad news reached me that beri-beri had broken out at Serenli, the only satisfaction I felt was that now, from the recent successful experiments by many observers, we really know something definite about the cause of the disease. Still more recently I see that the Eastern branch of the British Medical Association have petitioned

interested governments to control the preparation of rice. It is by keeping in view this recent work and especially the excellent research of Fraser and Brandon, that I have tried to trace the cause of this outbreak. Before leaving Gobwen I wrote to the Provincial Commissioner giving him the names of the different kinds of rice obtainable in the local shops and asking him to send samples to Nairobi for examination, but leaving on the same day I never heard the result.

The first thing, then, is to consider the quality of the rice issued at Serenli. We need not trouble about any date previous to June, 1911, as at that time there was no rice on the station and food was urgently needed. Towards the end of June B Company arrived bringing the first consignment. The rice had been long in transit, having been stored over seven months in Gobwen. It is said that it did not arrive here until over a year after being bought from Boustead and Clarke at Mombasa. Sub-Assistant Surgeon Iman Bakhsh has given me this and the following information about the previous history of the rice. If important it could be easily verified. It is also stated that the rice got wet on more than one occasion. However, the sub-assistant surgeon assures us that this first rice was of much better quality than the next two consignments. In July 36,225 lbs. are shown in the books. The second supply is said to have come from Zanzibar and in the same steamer from Mombasa with C Company who reached Serenli at the end of July. This rice, 25,000 lbs., was bad, old, broken and often matted together in lumps.

It is of interest to note here that C Company, when stationed at Zanzibar, suffered from a slight outbreak of beri-beri in the autumn of 1910. They quickly recovered on being at once removed to Nairobi (October, 1910). They left for Jubaland, May 30th, 1911.

The third lot of rice was sent by the last steamer of the year, November, 1911, and is said to have been bought locally at Kismayu. It was consigned to the Civil Department, but was taken into general store and was in poor condition. Now it would be satisfactory to nail down one particular batch as the cause of the outbreak, but this seems to be impossible. The sub-assistant surgeon thinks that the first consignment was finished before the second was begun, and there is no doubt that he considers the second (Zanzibar) batch guilty.

On November 2nd very heavy rain fell at Serenli, the store was not watertight and many of the bags became wet.

On November 6th the Inspector-General left with an escort of 25 men from C Company. They took 1,400 lbs. of rice. Considering that such a large proportion of men remaining in Serenli contracted beri-beri shortly afterwards and that none of the Inspector-General's escort have ever shown any signs of the disease, it seems to be proved that the outbreak occurred between November 6th and the end of the month. The sub-assistant surgeon does not agree with this. He considers that the outbreak is the result of long continued consumption of rice of poor quality, and accounts for the immunity of the escort to the fact of a complete change of surroundings and, later, the climate (Moyali). He also says that the amount of rice eaten on this trip was individually small, as food was scarce.

Much discussion has lately taken place on the properties of polished rice. There seems to be a consensus of opinion that by milling in this way the rice loses some important constituent, the absence of which causes the disease. Now, at Serenli, we have no polished rice, all three batches have been the common "Halwa" white rice, which may easily have been old when bought and which had since still further deteriorated.

But I have not read, in the course of these discussions, that there is supposed to be any particular danger of beri-beri from eating rice of inferior quality. On the contrary, one medical man wrote that in the institution under his charge he attributes the freedom from beri-beri to the fact that the authorities were too poor to use such expensive rice as the polished variety.

Yet, surely, it is conceivable that rice may become so affected in course of time, especially when exposed to wet and heat, and after much transport in single bags of sacking, as to approach the condition of the polished variety to the extent of losing the same constituents contained in the layer under the pericarp.

In this connection, sub-assistant surgeon Imam Bakhsh calls my special attention to the action of weavils. The rice in Serenli was overrun by these pests and it is interesting to examine their method of attack. With a strong glass it can be seen that though some grains are bored through, more commonly the path of the weevil is shown in longitudinal grooves parallel to slight ridges (which seems to be ridges of attachment to the husks, or perhaps are formed during husking). The grain is not completely eaten away, but a large quantity is damaged in this way. I should like to see how such a rice would stand Fraser and Stanton's phosphorus pentoxide test.

Ten years ago at Afmadu we had a similar outbreak. One company of Soudanese was camped in a small boma. The only food was rice of very indifferent quality, which had remained over from the Ogaden expedition. Other favourable conditions were also present then: heat, damp and overcrowding.

So the evidence seems overwhelming that this disease is at any rate in part caused by rice which is probably deficient in certain constituents or nutritive qualities.

But before leaving the consideration of the part played by rice, I wish to protest against some of the conclusions drawn by Schaumann, *e.g.*, that the disease can be cured by change of diet. He is supported by many observers.

But in this epidemic change of diet appeared to have no effect on the course of the disease, which, in my opinion, was contracted in November.

Cases occurred one, two and three months later, *i.e.*, with a long or short incubation period. Rice was stopped early in December, yet our largest mortality was at the end of February.

Schaumann finishes his paper by saying: "All the effects taken together seemed to him, however, only to allow of one conclusion—that beri-beri was a disease due to deficient metabolism of phosphorus and its consequences." But the evidence seems very thin for this one conclusion. Before, during, and since the epidemic under consideration, a liberal ration of meat has been issued to the troops, amply sufficient to supply any deficiency of phosphorus. Of course, it may be argued that in normal rice phosphorus is in a state of combination specially suitable for metabolism, but then, those people who do not eat rice at all are said not to get beri-beri. In fact, in stating that a deficiency of some constituent, not the presence of some harmful substance, is the cause of the disease, I think that the authorities are taxing our powers of credulity sufficiently without prematurely fixing on phosphorus as the guilty absentee. Now, leaving the rice, we must consider other possible contributory causes. This is obviously necessary if one is to answer such questions as the following: All through the Protectorate indifferent Halwa rice is eaten in large quantities, why is beri-beri not more common? Or, again, why, in spite of the fact that rice was issued to all hands on the station, including Somali syces and Swahili porters, did only the Soudanese troops and, later, their wives, contract the disease?

LOCAL CONDITIONS.

HEAT.—Those who only know Serenli by visiting the station in the cool months, May to October, which happens also to be the time the river is navigable, can have no idea of the extreme heat from November to February. One officer, who has served in India on the plains in hot weather, at Aden and at Berbera, assures me that he has never suffered from the effects of heat to such an extent as was experienced here last December and January. The usual maximum shade temperature on the verandah of the Officers' quarters was 96° (Lieut. Davies) but was probably higher in the lines at the back of the station.

DAMP.—With the exception of the storm at the beginning of November, already mentioned, there was no rain until March. So at the time when the epidemic was at its height, the station was very dry and sun scorched. Nor did the rains when they came cause any recrudescence of the disease.

OVERCROWDING.—The military quarters consist of seven lines, each line has ten rooms, ten feet square.

At the end of October the strength was as follows:—

Troops	...	...	...	...	...	156
Women and children	...	...	...	...	...	133
TOTAL						289

An average of over four to a room. But to the human beings must be added the large amount of kit which Soudanese women manage to accumulate, such as mats, clothes, basket-work, pots and pans, chickens and boxes, including to my surprise tin uniform cases. Cloth is usually hung up in different parts of the room to act as curtains for privacy and to stop any fresh air which might try to get in. The result is a dark stuffy place with hardly room to turn round.

TRIBAL INFLUENCE.

This is the third epidemic of beri-beri in East Africa during the last ten years of which I have had personal knowledge. Other outbreaks may have occurred but I have never heard of them. In Uganda some years ago it was reported, but when on the spot a year or two later at Katwe (between Ankole and Toro) it was hard to authenticate. The disease seemed more likely to have been Malta fever.

Now, in each of these three outbreaks the sufferers have been the Soudanese troops. The first was at Afmadu, in Jubaland, in 1902. After forced marches from Yonti, about 50 miles, a company was left to guard the wells. The men were cooped up in a small boma. It was very hot and to add to the men's discomfort rain came on. The only food was rice

which had been many months in the country, and was part of a large quantity left over from the Ogaden Expedition. After a few weeks the officer, who was then alone, I having left a fortnight before, had so many sick that he decided to evacuate the place. He was afraid that the disease was plague. Two died at Afmadu, three on the road, where I met them ten hours from Yonti, and afterwards one died in Yonti Hospital. The symptoms were similar to the present cases, but the epidemic was milder and sooner over. The rice, some hundreds of bags, was thrown into the sea with the exception of six bags, which appeared to be in good condition. These six bags were sold by auction. No more cases appeared for some months when a man was admitted to Kismayu Hospital with every symptom of a mild attack.

It was found that this man had been in the habit of getting rice from an Indian, who admitted that he had bought it at the Government sale. The remnant of the six bags was then traced and thrown into the sea.

The Zanzibar outbreak was slight. I am told that the Nandi Company suffered as well as the Sudanese. One corporal died at Mombasa on the way to Nairobi.

The question whether the Sudanese or any tribe is especially liable to this disease is impossible to answer, but it may be worth while to consider their history in this country. Though called Sudanese many of them come from the northern part of the Uganda Protectorate. A few were enlisted at Khartoum but the majority are the remnant of men who were with Lugard, some as boys and others have been born in the regiment. Though consisting of a mixture of many tribes they have kept to themselves, looking down upon local tribes and perhaps they have deteriorated by intermarriage. Ever since the Uganda mutiny, officers have been anxious to keep these men as they are naturally good soldiers, but, physically, it is doubtful if they are so fit as their officers used to maintain. They are bad weight carriers, and not so good at marching as many other natives.

Lieut. Davies considers that the true Northern Sudanese has shown greater resistance to beri-beri, but I have been unable to prove it.

The number of cases and deaths in the different tribes is seen in the following list:—

Tribe.	Locality.	Beri-beri.	
		Cases.	Deaths.
Mahraba	Belgian Congo	13	5
Lendu	—	11	8
Munyero	—	9	3
Moro	Congo	9	5
Alur	Wadelai	8	5
Mandu	Congo	7	1
Kuku	Gondokoro	5	1
Abukaya	Lado	5	1
Dinka	Darfur	4	2
Farawi	Khartoum	4	1
Bari	Gondokoro	4	1
Nuba	Khartoum	3	2
Fartit	Darfur	3	1
Baka	Nimule	2	1
Zambara	Khartoum	2	2
Bukeddi	—	2	—
Mahdi	Nimule	1	—
		92	39

Old theories die hard. It is impossible to go through an epidemic like this without feeling strongly that a germ is or has been at work as a cause of the disease. Lately attention has been drawn to the intestinal flora. It is conceivable that there may be certain broad differences in this flora in different races. To give a simple but pungent example: we consider that a native has a peculiar and unpleasant smell, and the native says the same thing about the European. Can it be that the Somali syces escaped this epidemic because, as their diet is naturally only milk and occasionally meat, their intestinal flora is such as to be unaffected by rice, which when eaten by the Sudanese gives an opportunity to some germs, usually present in insufficient numbers, to cause disease?

Is beri-beri a place disease and ought Serenli be given up as a Government station? The local conditions have shown themselves suitable for an outbreak but there is nothing to show that any other place in the neighbourhood would be any better. The recent work seems to be in favour of the view that if beri-beri has occurred in a place there is no special reason why it should recur. This is stated with all reserve. Dr. Thomas, of the Liverpool School

of Tropical Medicine, working on research work on yellow fever at Manaus, in Brazil, has told me that he came to look upon one of his hospital wards as the beri-beri ward, as in spite of emptying and whitewashing the room, patients so often developed this disease though admitted for other complaints. No particular lines of quarters were implicated in this epidemic.

AGE, SEX, ETC.—The children escaped. The woman developed the disease later, in a milder form, and in smaller numbers than the men.

Buglers and N.C.O.'s suffered more severely than the rest of the rank and file. The former perhaps from extra heart strain, the latter from trying to keep going when really unfit.

Often the incubation period seemed to have been unusually long, as the majority of new cases occurred in February, about two months after rice was discontinued.

The attached list shows the names, tribe, etc., of all the cases and a very heavy death rate, especially among those first attacked. From this list we find :—

						Cases.	Deaths.
In November, 1911	...	...	...	...	...	1	1
„ December, 1911	...	...	...	...	...	1	1
„ January, 1912	...	...	...	...	...	22	7
„ February, 1912	...	...	...	...	...	63	23
„ March, 1912	...	...	...	...	...	18	10
„ April, 1912	...	...	...	...	...	7	2
						112	44

This includes 25 women with 3 deaths. The figures give a mortality of 39 per cent., but among the soldiers alone it was as high as 47 per cent.

PREVENTION.

Diet is the most important consideration in prevention of beri-beri.

In Serenli the troops have had to rely on rations supplied by Government. Until the disease broke out it was thought sufficient to issue a partial ration which the men could supplement with food bought from the canteen and local shops, also with vegetables grown by themselves, plots of land being lent to them for cultivation.

The condition of the rations supplied by Government has been described ; with the exception of meat it was unsatisfactory.

The canteen is empty.

The crops failed.

Under these circumstances it is a simple matter to point out what ought to be done, though by no means so easy for officers to carry it out, owing to difficulties in transport, storage, etc., as well as to the extra expense involved.

When other food is not procurable the Government must supply full rations.

Experienced military officers have had charge of dieting the troops, but one feels inclined to accuse them of not accommodating the supply to special conditions.

Those in charge know well the barrenness of the country.

The rations issued would have been adequate in a country inhabited by an agricultural community such as we are accustomed to in the older stations of East Africa and most of Uganda.

But surely here, and probably throughout the Northern Frontier district, the conditions are absolutely different.

Little or no food can at present be obtained locally.

The very few Gosha people in the neighbourhood barely cultivate enough for themselves.

It seems still to be a popular notion that natives can live on one kind of food only. Nomadic tribes such as Somali and Masai can, and often do, live simply on milk with an occasional feast of blood and meat. But milk is about the only complete food known.

If natives eat only one kind of food such as grain, the deficiency of one of the three main constituents necessary for proper nourishment has to be made up by eating enormous quantities, and this has to be taken into consideration in the amount of ration.

But among the vast majority of East African tribes the variety of food consumed is much greater than is generally supposed. In the country from which these Sudanese came it is considerable, grain, bananas, sweet potatoes, beans of various kinds, pumpkins, cassava, ehillies, etc., may all be found near the same village.

So long as the troops, and this applies also to the Nyasaland Company on its way here, are not supplied with a liberal and varied diet, they will be liable to suffer from this or some other dietetic disease.

With regard to the canteen, or rather a company's shop, which has been given facilities to start here, what is its use if empty? Surely a regular contract should be made and enforced to keep the required amount in stock.

This station has now been in existence two years, but in spite of the lack of all vegetables no serious attempt has been made at irrigation. The soil near the river on the east side of the station is suitable, yet there are no pumps, not even a shaddaf. It is useless to rely on such a scanty and doubtful rainfall. In Jubaland rain occasionally for a short time falls in bucketfuls but it can never be depended upon.

When these deficiencies have been supplied it will be time to think of partial rations. It is as important for the Government as for a wife to feed the brute.

The diet which I have already suggested (No. 11 of April 22nd, 1912) is as follows:—

FULL RATION ONE WEEK.

									lbs.	oz.
Cured parboiled rice	...	...	...	...	...	...	...	...	3	8
Mahindi, Mtama or Wheat flour	...	...	...	...	...	...	...	...	3	8
Meat	...	...	...	...	...	...	...	...	4	0
Ghee	...	...	...	...	...	...	...	...	—	14
Dates	...	...	...	...	...	...	...	...	2	0
Salt	...	...	...	...	...	...	...	...	—	3

CURED RICE.—Comparatively little cured parboiled rice is sold in East Africa, but the Indians use it amongst themselves. At the end of January in Kismayu and Gobwen only ten bags could be found in the shops. But this rice can easily be obtained from India or Madagascar.

I have been unable to find out here how Muanza rice is milled.

Names of some of the different kinds of rice sold in East Africa :—

White, uncured.
Halwa, much the commonest, many different qualities Korbai.
Cured Parboiled.
Matakoso.
Mukini (Madagasear).
Dawood Khan.
Gumpti, sometimes cured sometimes uncured.

Ghee is probably best bought on the spot or in Marehan country. A small quantity has lately been obtained at Rs.12 a frasila, but the local market price is often up to Rs.16 and much higher. The latter price is about the same at Gobwen if bought in August or September. At some seasons it is more, as the Indians store and corner for a high price.

The importance of protecting the food during transport and storage cannot be over-estimated.

After the last steamer of the season, in October or November, transport is difficult and expensive, so sufficient food should be in store to last until the following June.

Grain, rice and flour should be packed in double bags, the outer one made of green canvas. This sounds expensive but on commissions to which I have been attached we found that it was really economy, the bags being damp and insect proof and strong enough to use over and over again. These double sacks were made in England, had brass eyelets for fastening and we used lead seals. As generally adopted here covering over the common sacks with skins is an excellent protection for camel transport through thorn bush but often a space is left where the skin is laced where damp, etc., can gain access.

During transport to Serenli so many opportunities occur for injury to perishable stores. Landing at Kismayu in wet and dirty dhows, faulty storage at Kismayu (N.B.—It is not unusual to see stores heaped up on the beach near the pier for some days waiting to be

taken to the Custom House), then transport to Gobwen, where it again has to be stored until a steamer leaves, and finally in a barge on the river, the food may easily be spoiled unless properly protected.

The store at Serenli has been unsatisfactory. Hitherto the houses have been built of local timber, mud and grass, but already the present Officer Commanding is building a substantial stone house which will shortly be finished.

You may justly consider that in giving these details, I am going beyond my province and that it would be better for me to mind my own business. My defence is that in a place like this the questions of rations, transport and accommodation are all intimately associated with the health of the troops as is emphasized by the late serious epidemic.

CHOICE OF STATION.

It would be interesting to know for certain whether the Government intend to keep a permanent station in this neighbourhood. In this report it is taken for granted that they do, and everything points that way; more troops are ordered here and arrangements are being made for patrols. Even if another post is started further north at Dolo, for instance, it will probably be necessary to hold some place below the rapids for the steamers to dump stores.

Is Serenli the best place in the district on the river for a permanent station?

In my opinion it is well chosen. From personal observation, the country further south, including the watering places at Hellashid, Milkaadi, Haggagubli and Dekatch, 38 miles south, offers no advantages. (See Capt. Williams' map of the Juba River.) Twenty miles south of this (60 miles from here) is Salugli. It is the northern limit of Gosha country, and from its position might become a useful site in the future, but need not be considered here. In the same way to the north I am told that there is no site with any particular qualifications.

Serenli is on rising ground looking sheer down on to the river with plenty of room for expansion to the west.

Away from the river, all surrounding country is thick thorn bush, but much clearing has been and is being done. The soil is dry and sandy. The site is well drained.

Mosquitoes are rare. Probably the risk of being infected with malaria is less here than anywhere between this place and Yonti.

To the east is a creek which fills when the river rises, and falling pools are left long enough for mosquitoes to breed. On his visit the Inspector-General suggested that this should be filled in, but he probably did not know that besides being an inlet from the river it is also an outlet for storm waters. During heavy rains a raging torrent rushes down into this creek to the river. It would be simpler and probably better to treat these pools (which are very temporary) with oil, one ounce to the square yard, or to make a concrete bed to the drain.

Though perhaps not the most central point on the river for dealings with the Aulihan Somalis, Serenli is in touch with this tribe and at the same time within reach of the more Northern Marehan. It is also a good kicking-off place for Eilwak wells and Moyali on the Abyssinian frontier. It is unlikely that Government will turn back now after two years' occupation. Serenli will eventually become a civil station and possibly may develop into a trade centre.

The fact that beri-beri has occurred here is not a sufficient reason for condemning the site.

Last, but not least, Serenli is within one hour of the wireless telegraph station at Bardera and so is in touch with the outside world.

ACCOMMODATION.

For the reasons given above it appears that a permanent station will be made here.

If so, why should it not be built at once? Some money must be spent on the place some time; why not now? Ten or more years ago it was not unusual to wait, before suitable houses were built, until an officer or two had died (this happened at Kisumu), but this is no longer the policy of the Government. Yet even now those stations far away from the centre are still liable to come off second best with regard to accommodation.

My description of Serenli may have left an impression that it is a healthy and pleasant place. On the contrary, under present conditions, it is a most trying place to live in.

The grass houses are infested by snakes (commoner here than in any place I know), scorpions, white ants, etc., and at certain seasons are invaded by wood lice in their millions.

The station is enclosed by a cloak of thick thorn bush forming an effectual check to shooting and ordinary forms of exercise. Until lately no one was allowed to leave the station. Cooped up in this way is it surprising that illness broke out during last hot season?

Those who visit Serenli for a day or two by steamer and think the place so nice and pleasant should stay a year to realise its deadly dullness. It is only by constant hard work that a man can hope to keep fit in such a place.

No officer should be made to stay in Serenli for more than one year. The Inspector-General was of this opinion and was much impressed by the dreariness of existence here.

If a good station is built and facilities given for obtaining stores the conditions of life will rapidly improve. In the near future two patrols going about the country will have the advantage of giving a change of scene and a fresh interest.

Captain Hickson, Officer Commanding here, has made out a rough plan for a permanent station. The stone store now being built is part of his scheme which I think is excellent.

The men's old quarters were built in lines, seven long houses containing ten rooms each, an arrangement pleasing to the military idea of order and regularity, but so designed as to prevent any breeze penetrating into the quarters.

During the hot weather each of the lines screened the next one from the small amount of available north-east wind.

Captain Hickson proposes now to pull down these lines and build round huts (at any rate for the present) on the west hill. This will be a great improvement.

The sides of the huts should not be closed by treating with mud but made of reeds, which offer sufficient protection and allow free ventilation. The floor should be concrete and the grass roof should reach well over the sides and high enough to give a good slope.

The river frontage at Serenli consists of two hills. The temporary houses for the Europeans have been built on the east hill and are in a good position. But the west hill is slightly higher, has a more extensive river frontage and by clearing gives a better view. Personally, I should prefer to see the permanent living houses for Europeans still kept on the east hill for themselves and servants, and give up the west hill for native lines, hospitals, etc. My reason being that it is a sound principle to keep the officers' quarters well away from the natives. However, both the hills are good sites and the two officers here at present consider west hill so much better that they propose to build the houses there. The question seems to me to be almost immaterial so long as the point I have mentioned is considered, *i.e.*, distance from native huts. A defence scheme may also make it advisable to build the officers' houses on the west hill.

Building material is hard to obtain locally, straight wood scarce, dôm palm leaves are very inferior to cocoanut for roofing. But plenty of stone is available and lime is being burnt on the spot, though probably of not very good quality. Unfortunately, labour is very scarce.

The stone houses should have broad verandahs and the living rooms instead of ordinary doors should have large open arches. The houses should be built with a view to the maximum amount of air during the hot weather, the small prevailing breeze being then from the north-east.

The excessive heat here for three or four months, especially in December, January and February, has been mentioned. During these months the hours of work, parades, fatigues, etc., should be arranged on the same lines as on a Plain station in India during the hot weather.

The wives of askaries should not be allowed to come to Serenli until the place is more settled and the accommodation much better than it is now.

In conclusion, I wish to point out that in the Commanding Officer's inspection report to His Excellency the Governor (paragraph 8, on the health of the troops) it is stated that the Medical Officer, Jubaland, recommends that cured rice be supplied in view of the possibility of an outbreak of beri-beri. Although this report was not issued until January in this year it was typed in Serenli as early as last September, months before the outbreak. This clears me and our department from any charge of want of foresight.

I have, etc., etc.,

(Signed) C. L. CHEVALLIER, M.O.

APPENDIX IV.

HINTS ON THE SANITARY CARE OF OUTSTATIONS FOR THE GUIDANCE OF ADMINISTRATIVE OFFICERS.

- I. STATION SITE.
- II. WATER SUPPLY.
- III. CONSERVANCY.
- IV. DISPOSAL OF RUBBISH.
- V. CAMPING GROUNDS.
- VI. BAZAAR.
- VII. BURIAL GROUNDS.
- VIII. QUARANTINE CAMP.
- IX. INSPECTION DUTIES.

I.—STATION SITE.

Improvement
of site.

1. Free circulation of air, *e.g.*, the clearing of undergrowth, cutting of grass.
2. Shade—judicious planting of trees with due consideration of their amenities when grown.
3. Prohibition in or near a station of such vegetation as fosters the breeding of mosquitoes, *e.g.*, sugar-cane, bananas, rice, cannas.
4. Filling in all depressions likely to retain water.

II.—WATER SUPPLY.

Avoidance of
soakage.

5. Where there is a possibility of drip from a tap, a soakage from a down pipe or at intake of stream accumulating, the ground should be dug out or trenched and filled in with rough stones.

Efficiency of
fittings.

6. In-let pipes from roofs, the overflow pipes from tanks, and trap-door entrances should all be close fitting, screwed or sealed by sandbag stockings or other contrivances to prevent the ingress of insect life.

Washing of
clothes.

7. The washing of clothes above, or in close proximity to where the water supply is drawn, should be prohibited. Dhobie quarters should be definitely marked off.

Water
carriage.

8. If water has to be carried any distance, special covered receptacles should be reserved for this purpose, such receptacles should be kept clean and periodically inspected.

A. From a
stream.

9. Obtain from the highest point feasible, and so chosen that, as far as possible, there is a minimal chance of contamination from latrine pits, cattle bomas, native huts or shambas, township drainage or refuse.

10. Intake to be kept cleaned and protected, and a separate place set aside for Europeans above that of Natives and Asiatics, below which, again, are the cattle watering places and dhobie quarters, the latter being in a situation higher up stream than the former.

B. From a
well.

11. Minimum amount of clearing should be a radius of four times the depth of a shallow well, and this area should be surrounded with a fence.

12. Mouth of well should be protected by a storm-water drain or, preferably, by a low parapet of good coping stones, and the inside of the well should, if possible, be built of masonry for a depth of 4 feet below the surface.

13. It is highly desirable that the well should be roofed over, and the roof to be kept in a thorough state of repair.

From over-
Lead tank.

14. If from overhead tank, such should be raised from the ground on a masonry base a sufficient height to permit of receptacles being placed underneath the tap. The tank should be provided on the top with a finely perforated cover capable of removal.

15. Twice a year, at the very commencement of the rains, tanks should be flushed out. If necessary they can be still more thoroughly cleansed by mops soaked in a solution of permanganate of potash (15 grains to a bucket of water) and washed out subsequently.

16. If from a partitioned underground tank, once a year each half of a tank should be emptied of water one at a time, thoroughly scrubbed, then mopped out with a solution of permanganate of potash (15 grains to the pail) and flushed out once more. Opportunity should be taken to examine carefully the interior for cracks in any of the walls, should such exist they should be reported to the Public Works Department forthwith. It would be advantageous to have all underground tanks fitted with pumps for purposes of obtaining water. D. From underground tank.

N.B.—It is advisable that all water for drinking purposes from whatever source should be boiled and filtered before use.

The filter should be of simple construction, preferably a Berkfeld or Pasteur Chamberlain or Doulton, and thoroughly cleansed at least once a month. For purposes of cleansing, the filter should be taken to pieces and the filtering medium boiled in water for 20 minutes before being replaced.

III.—CONSERVANCY, NIGHT SOIL REMOVAL.

17. The bucket or earth closet system, if carried out efficiently, is preferable. Each bucket privy should be provided with a box of loose earth and a scoop and it is essential that after each use, sufficient earth should be thrown in to cover everything. It might be advisable to dust the seat of the closet before use with an antiseptic powder to prevent chigger infection. A. Bucket or earth closets. Use of buckets.

18. Pail should be removed once in 24 hours (or oftener if necessary) at stated times, preferably between the hours of 10 p.m., and 6 a.m. (Number of sweepers employed depends on (a) number of buckets to be emptied, (b) distance pails have to be transported to dumping grounds.)

19. The pail contents should be buried, carefully and methodically, in trenches at the nearest suitable spot, so as to avoid cartage and spilling, to the leeward of the station. Disposal of night soil.

20. The plot of ground for this purpose should be 50 yards by 50 yards and a loamy soil is preferable. The site should be at a considerable distance from any water supply and the trenches should be dug across and not in the direction of the natural drainage of the station. The line of furrows must be accurately marked off by cord and reel. The earth removed from the first furrow must be collected in a heap at one spot as it will ultimately be wanted to cover the last furrow. Construction and use of trench.

Each trench should be 9 inches wide by 9 inches deep. (Note.—A trench 8 feet long will suffice for the fæces of 100 men.) The trench being filled with fæces, mark out a digging line 12 inches behind and cover the fæces in the first trench by the earth removed in making the second. When completed, the surface of the trench must be left smooth and perfectly neat, no particle of fæces or paper being uncovered. These places can be subsequently cultivated.

21. The pails before being taken back should be well scraped, and a little earth thrown in the bottom, and the sides well dusted with mould. The pails should not be washed. Cleansing of pail.

Where possible a double system of buckets might be in use, the foul bucket being removed and taken to the dumping ground and a clean bucket with the inside coated with a little tar substituted.

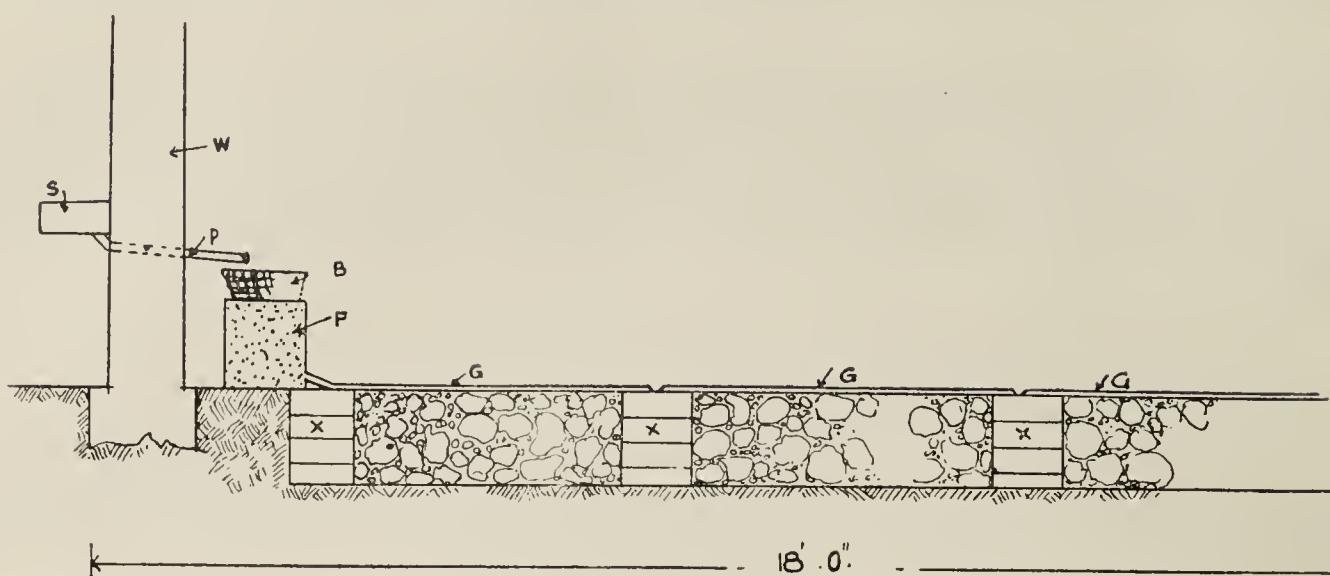
22. Where the bucket system is not in force the system of cho-pits may be advantageously continued. Red soils and the coral formation at the coast are both suitable. B. Cho-pits.

These should be 20 feet deep, 4 feet diameter, boarded over, leaving an aperture a little smaller than the size of the box seat placed over it. The box seat (14 inches in height) should be well ventilated at the sides. The pit must be adequately protected from the entrance of rain or the drainage of water. Construction.

A shallow covering of earth should be deposited in the pit once a week. All cho-pits should be dug well away from any stream or water supply.

Kitchen slop
water.

23. Refuse water from kitchens should be disposed of by the Vivian Poore filtration gutter; the accompanying diagram will explain:—



REFERENCE :

S. SINK. W. WALL OF BUNGALOW. P. WASTE PIPE.

B. BASKET CONTAINING STRAW. F. FILTER

G. CAST IRON FILTRATION GUTTER. SUPPORTED IN TRENCH BY "X" COLUMNS OF BRICK ON EDGE.

The waste pipe should project outside the wall of the house some 18 ins. so as to avoid splashings.

The strainer consists of a perforated holder or basket with a wisp of straw, which acts as a fat-arrester. This straw may be burnt and removed as often as is necessary. From the strainer the slops flow into an iron receptacle (kerosine tin) with a hole at the bottom leading into the gutter, and filled with broken stone varying in size from peas at the bottom to walnuts at top.

The filtration gutter consists of a 12 to 24 ft. length of guttering perforated from below upwards with holes, laid on loose porous gravel placed in a trench. The trench is 18 ins. wide and 18 ins. deep, care being taken that it slopes away from the house to prevent a flow back towards the building. The lengths of guttering are then laid on a level with the top of the trench, the level being maintained by suitable stones. Such a trench can be carried across a road and it is strong enough for wheel traffic.

Bath and
waste water.

24. Slop and bath water should be carried off by open way to a buried drain, *i.e.*, a surface drain trench filled with broken stone.

25. Station drainage and irrigation channels should be maintained in good repair, free from weeds, stones or refuse, and stagnant water.

If the water supply of the station be from a well the drainage ought, if possible, to be carried off at some distance from such. Drainage should not be discharged into streams above the water intakes for the station.

IV.—DISPOSAL OF RUBBISH.

Refuse box.

26. Each compound must be provided with a box for household refuse and sweepings with a cover to keep the rain out. The station staff will empty this box once a day.

Dumping
grounds.

27. At certain convenient spots in the station, as far as possible to leeward and away from the water supply, certain sites will be assigned as dumping grounds. The number of these places will be as few as possible consistent with the size of the station. To these places will be brought the contents of the compound rubbish boxes, road, and station sweepings. On stated days these pits will be set fire to, with the help of a little paraffin if necessary. Should they become too foul they can be earthed up.

Refuse
destructor.

28. A more preferable form of rubbish disposal is by means of a refuse destructor. The following description of an incinerator or destructor and its mode of use is quoted for general information. It was erected at Kampala at a cost of Rs. 62/50 (*vide* "Third Report, Welcome Research Laboratory.") :—

"It consists of a simple cubical furnace the roof of which tapers to connect with
"a square chimney shaft.

"It is built of brick and cement and rests on a concrete base.

"It is fitted with an iron grating (of bars $\frac{1}{2}$ in. thick and 2 ins. apart) 1 ft. 10 ins. from the floor which supports the fuel, excreta, etc., which is introduced through the square opening at one side above.

"This opening is closed when required by an iron plate fitted with a handle.

"A second opening below the level of the grating permits of a free draught of air to the furnace and of the removal of ashes."

As regards the fuel used to start the furnace :—

"We find that shavings are the best together with other dry rubbish collected in the town, such as papers, corn cobs, and grass gathered in station clearing. For the latter a shed is provided with a raised platform in order to dry the grass. The fuel, therefore, may be said to cost nothing as all of it would have to be collected and deposited somewhere."

As regards the method of working :—

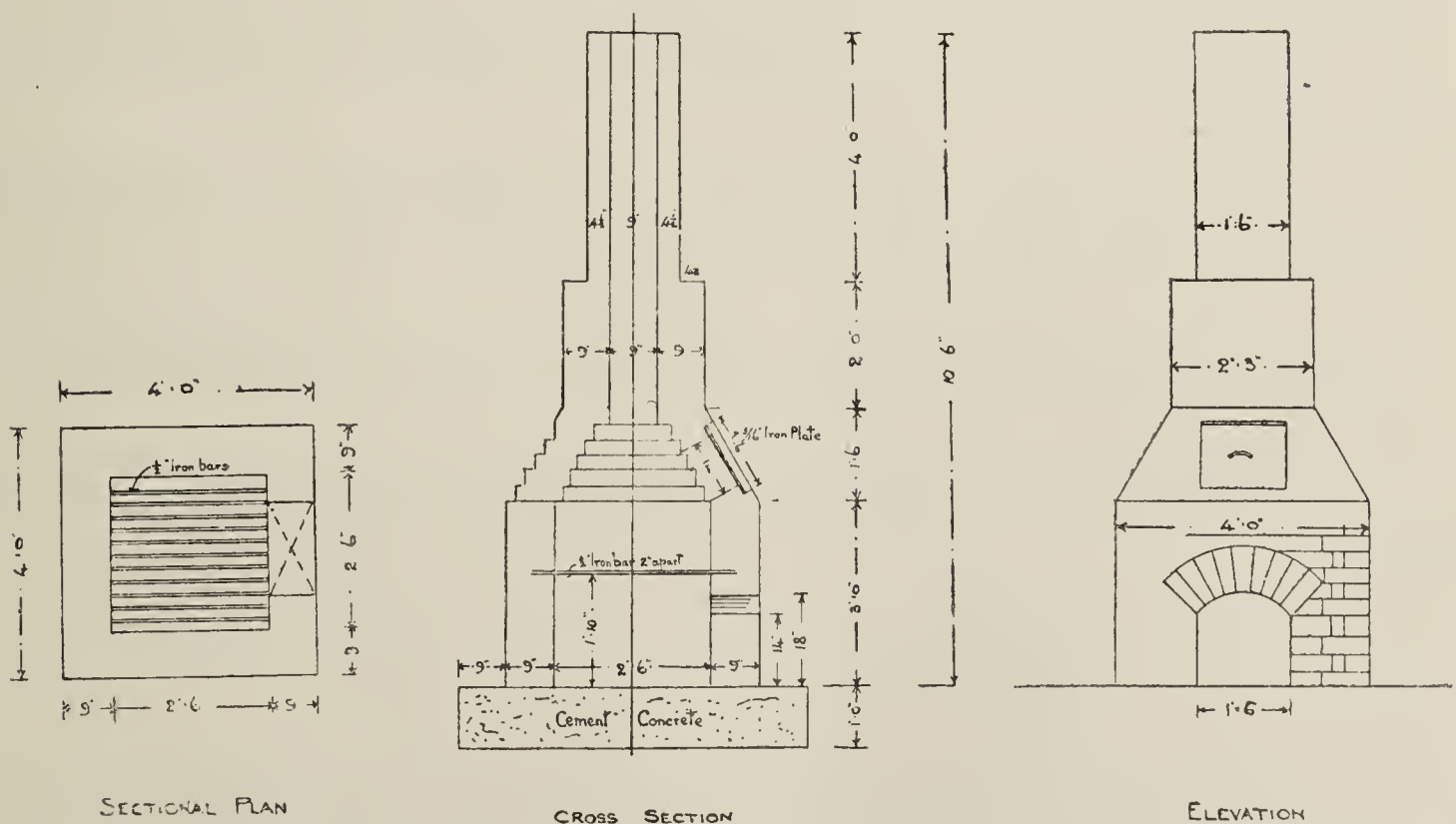
"The incinerator should be nearly filled (above the grating) with fuel and a good blaze started. Before the fuel is burnt the excreta, rubbish, etc., should be thrown on the flames, in moderate quantities at intervals, occasionally adding more fuel if necessary. Very little added fuel is needed if this is done properly as the great heat created causes the water in the more fluid portions of the excreta to be given off in steam, and the dry residue is converted into fuel itself and burns right out.

"If too much excreta, especially if it is wet, is dumped in at a time, the flames are partially or wholly extinguished and the unburnt fuel soaked with water, so that the process is delayed and a much larger quantity of fuel is required.

"There is practically no obnoxious odour produced from the incinerator, but if it is placed close to and to the windward side of a dwelling, the smoke might be found a nuisance to the occupants.

"The residual ashes should make excellent manure for all crops."

It will be seen both from the description of the Kampala incinerator as well as from the attached prints that the intention is to burn refuse in a draught. Consequently, if the Administration Official in charge can procure some iron bars and can find some ant hill or other earth near his station capable of being puddled and moulded or made into sun-dried bricks, he will probably find that he can design an efficient destructor at a very moderate cost.



Prior to tipping rubbish into the destructor, bottles and tins should be sorted out and buried.

V.—CAMPING GROUNDS.

29. These should be marked off on a convenient site with ready access to water supply. Site. One portion should be reserved for Europeans (with cho attached) and servants; the other for the porters and their cho; there should be two refuse pits, one for each of these quarters.

The chos and refuse pits ought to be placed in that part of the camping ground which is farthest from the water supply.

30. On arrival the visitor should be met with rules directing him (1) where to pitch tents for himself, his porters, and his animals, (2) where to obtain water for ditto, (3) to position of camp latrines, (4) where fuel and food is to be obtained, (5) and finally, a request that, before departure, he should clean the camp and deposit all refuse and camp sweepings in the places set aside for that purpose

VI.—SANITATION OF BAZAAR.

Essential features. 31. The points to be chiefly noted are (1) cleanliness of house and surroundings, (2) if cho pit system is in vogue, these must all be dug outside the compound and in sites approved, (3) accumulation of water, (4) as far as possible the stabling of animals in compounds should be discouraged.

Sale of meat. 32. The sale of meat should be conducted as far apart from other trades as is practicable and in a rain and sun proof building. All articles in use should be daily scoured with clean sand or scrubbed with soap and water. Waste should be burned or buried. Meat exposed for sale must be placed on boards or hung up on hooks, not lying on the ground on skins. Foods such as meat and vegetables for sale should be inspected daily.

Native Market. 33. Should be maintained in a tidy condition and in a banda if possible. At the close of the market it should be swept.

VII.—BURIAL GROUNDS.

Site. 34. Sites should be set aside for Europeans, (2) Asiatics, and (3) Africans, and should be chosen at some distance from the station, and from water, and if possible in situations where the drainage will be away from the watering place. The soil should be of a porous nature, and graves 6 feet in depth. It would be of advantage if graves were numbered and a register kept. Cemeteries should, if possible, be fenced in and trees planted.

VIII.—QUARANTINE STATION.

Site. 35. An area for the segregation of infectious diseases cases should be reserved in every station, and the site so chosen as to render isolation effectual. The site should be fenced in and only one entrance provided on which a guard could be placed when in occupation. The best type of accommodation is the ordinary grass hut, inasmuch as it can be burnt afterwards. One corner of the compound can be set aside for cho-pits. Water and fuel should be provided when required.

Procedure in cases of infectious diseases. 36. On the occurrence of a case of infectious or contagious disease, or a suspected case, the patient will be promptly placed in the camp and a guard placed over him, and the premises from whence the patient was removed disinfected.

Contacts. 37. The names of those who have resided in the same house as the patient will be noted, and they will be inspected for a varying number of days, on the termination of which they should be discharged if free from disease.

Observation period for various infectious diseases. 38. The following is the number of days a person who has been in contact with an individual suffering from any of the undermentioned diseases should be kept under observation :—

Small-pox	...	...	...	...	18 days
Mumps	...	...	...	...	25 „
Chicken-pox	...	...	...	...	18 „
Plague	...	...	...	...	5 „
Measles	...	...	...	...	18 „

Disinfection of building. 39. The disinfection of an infected house should be a spring cleaning—all articles being taken out and spread daily in the sun for three or four days. On the first day the house should be thoroughly cleaned out and, if possible, washed down with disinfectants (*e.g.*, Jeyes' Fluid—4 tablespoonfuls to the bucket, or lime wash). It should be remembered that the cheapest disinfectant is sunlight and fresh air. Thus it will generally be possible to remove either thatch, or a portion of the roof, and expose the house to the effect of sunlight for a period of three days, provided, of course, that such action does not damage the permanency of the structure. Should plague or small-pox break out in a hut which in the opinion of the officer is of very little monetary value, the hut should be burned.

Disinfection of domestic articles. 40. Of household articles whatever can be washed should be treated with hot water and soap; articles such as tables, etc., can be washed.

IX.—DUTIES OF ADMINISTRATIVE OFFICER IN CHARGE OF STATION.

41. The Administrative Official in charge is responsible for the cleanliness and good order of his station. He should make weekly inspections of such station and satisfy himself as to the conditions of :—

- (a) The approaches to water supply.
- (b) The houses of the station including those of the bazaar.
- (c) The water storage tanks (should such exist.)
- (d) The drains (should such exits).
- (e) The cemeteries.
- (f) The slaughter-house and market.
- (g) The roads.
- (h) The public latrines.
- (i) The refuse destructor.

He should also see that no opportunity is afforded for the breeding of mosquitoes in the station.

These duties should not be delegated to clerks, headmen or others.

Twice a year at least, all roof gutters should be inspected, and if necessary cleared out. This is best done just prior to the commencement of the rains and when the tanks (if any) are being cleaned out.

The Medical Officer in charge or, in his absence, the Medical Assistant will periodically and at irregular intervals satisfy himself as to the sanitary condition of the station, and promptly bring to the notice of the official in charge any defects which may have come under his observation.

